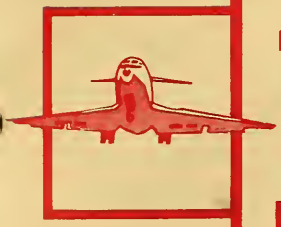


PB87-917004

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

HAZARDOUS MATERIALS ACCIDENT REPORT

HAZARDOUS MATERIALS RELEASE FOLLOWING THE DERAILMENT OF BALTIMORE AND OHIO RAILROAD COMPANY TRAIN NO. SLFR MIAMISBURG, OHIO JULY 8, 1986

NTSB/HZM-87/01

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NTSB/HZM-87/01	2. Government Accession No. PB87-917004	3. Recipient's Catalog No.
4. Title and Subtitle Hazardous Materials Accident Report—Hazardous Materials Release Following the Derailment of Baltimore and Ohio Railroad Company Train No. SLFR, Miamisburg, Ohio, July 8, 1986		5. Report Date September 29, 1987 6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No.
9. Performing Organization Name and Address United States National Transportation Safety Board Bureau of Accident Investigation Washington, D.C. 20594		10. Work Unit No. 4462A 11. Contract or Grant No.
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20594		13. Type of Report and Period Covered Hazardous Materials Accident Report July 8, 1986 14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract On July 8, 1986, 15 cars of a southbound Baltimore and Ohio Railroad Company freight train derailed while traveling at 45 mph near Miamisburg, Ohio. Three of the 15 derailed cars were tank cars containing yellow phosphorus, molten sulfur, and tallow. While derailing on a bridge, these tank cars were extensively damaged, lost product, and were involved in the resulting fire. Approximately 7,000 residents from a section of Miamisburg were initially evacuated as a safety precaution. On the following day as a wreckage-clearing crew was preparing to remove the smoldering phosphorus tank car, a concrete structure supporting the tank car collapsed, and several hundred gallons of molten phosphorus inside the tank car escaped and ignited, resulting in an extensive cloud of phosphorus combustion effluents. During the following 48 hours, a 3-square-mile area of Montgomery County, Ohio, was evacuated, forcing an estimated 30,000 people to leave their homes and businesses; 569 persons were treated for various complaints during the incident. Total property damage was $3,540,000 including the cost of hazardous materials.

The National Transportation Safety Board determines that the probable cause of the uncontrollable release of phosphorus was the failure of the unprotected bottom brake support attachment during the derailment resulting in the tearing of the tank shell. Contributing to the rupture of the tank was the Federal Railroad Administration's failure to require retroactively that reinforcement pads be installed between tank shells and welded attachments.

17. Key Words	18. Distribution Statement
tank car; fire; hazardous materials; emergency response; derailment; phosphorus; sulfur; tank car attachment; AAR; Tank Car Committee; FRA; delegation of authority	This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	94	

NTSB Form 1765.2 (Rev. 9/74)

CONTENTS

CONTENTS (continued)

EXECUTIVE SUMMARY

At 4:25 p.m., on July 8, 1986, 15 cars of a southbound Baltimore and Ohio Railroad Company freight train consisting of 44 cars and a locomotive, derailed while traveling at 45 mph near Miamisburg, Ohio. Three of the 15 derailed cars were tank cars containing yellow phosphorus, molten sulfur, and tallow. While derailing on a bridge, these tank cars were extensively damaged, lost product, and were involved in the resulting fire. Approximately 7,000 residents from a section of Miamisburg were initially evacuated as a safety precaution.

On the following day, as a wreckage-clearing crew contracted by the railroad was preparing to remove the smoldering phosphorus tank car, a concrete structure supporting the tank car collapsed, and several hundred gallons of molten phosphorus inside the tank car escaped and ignited, resulting in an extensive cloud of phosphorus combustion effluents. During the following 48 hours, a 3-square-mile area of Montgomery County, Ohio, was evacuated, forcing an estimated 30,000 people to leave their homes and businesses; 569 persons were treated for various complaints during the incident. Total property damage was approximately $3,540,000, including the cost of hazardous materials cleanup.

Observation of emergency response activities and the conditions that led to hazardous materials release following the July 8, 1986, derailment in Miamisburg, Ohio, prompted the Safety Board to conduct this hazardous materials accident investigation. The investigation revealed that the major release of phosphorus came from a breach in the tank shell in an area where a bottom attachment was welded directly to the tank shell. Other tank shell failures at attachments have raised the Safety Board's concern about the adequacy of Federal safety standards and the Federal Railroad Administration's oversight of tank car performance. As a part of this investigation, the Safety Board reviewed the adequacy of the Federal Railroad Administration's delegation to the Association of American Railroads of tank car safety authority and how the FRA monitored actions taken by the AAR under the delegated authority. The safety issues discussed in this report are:

- effectiveness of hazardous materials emergency response activities and guides inducing the outcome of the emergency;
- crashworthiness of hazardous materials tank cars during derailments; and
- effectiveness of FRA's delegation of authority to the AAR for tank car safety.

As a result of its investigation, the Safety Board issued recommendations to improve the accuracy and consistency of information provided in emergency response guides; to identify and report tank car deficiencies; to determine the adequacy of tank car specifications; and to establish procedures for determining that tank car construction and repair comply with Federal standards. The Safety Board made recommendations to the Federal Railroad Administration, the Research and Special Programs Administration of the U.S. Department of Transportation, CSX Transportation, and the Association of American Railroads concerning these safety issues.

The National Transportation Safety Board determines that the probable cause of the uncontrollable release of phosphorus was the failure of the unprotected bottom brake support attachment during the derailment resulting in the tearing of the tank shell. Contributing to the rupture of the tank was the Federal Railroad Administration's failure to require retroactively that reinforcement pads be installed between tank shells and welded attachments.

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20594

HAZARDOUS MATERIALS ACCIDENT REPORT

Adopted: September 29, 1987

HAZARDOUS MATERIALS RELEASE FOLLOWING THE DERAILMENT OF BALTIMORE AND OHIO RAILROAD COMPANY TRAIN NO. SLFR MIAMISBURG, OHIO JULY 8, 1986

INVESTIGATION

The Accident

At 4:25 p.m., on July 8, 1986, 15 cars of southbound Baltimore and Ohio Railroad Company 1/ (B&O) freight train Southland Flyer (SLFR), consisting of a locomotive and 44 cars, derailed while traveling at 45 mph on a through-plate bridge 2/ (bridge 497 at milepost 49.7) spanning the Bear Creek at Miamisburg, Ohio. (See figure 1.) Train SLFR was being operated with all four crewmembers in the locomotive and with an "end-of-train" monitoring device. 3/ Three tank cars were breached and lost some or all of their contents. Within minutes, large plumes of smoke were emitted from the wreckage, and soon thereafter a large pool of spilled materials ignited.

The locomotive and the 1st through the 27th cars remained coupled together and stopped 21,867 feet south of bridge 497. Four of these cars, the 24th through the 27th, were derailed but remained upright and separated from the trailing cars by 1,531 feet. The next 11 cars, the 28th through 38th, were derailed but remained aligned with the track structure and stopped south of the bridge. The remaining cars stopped on the north side of the bridge. (For more detailed information, see appendix B.)

Hazardous Materials Release

The 30th car, Union Tank Car Company (UTLX) 79499, a tank car loaded with yellow phosphorus, came to rest on its side south of the bridge with its dome rotated to the east approximately 45°. The tank car's 2-inch water introduction pipe was open, the B-end

1/ At the time of the accident, the Baltimore and Ohio Railroad Company was a subsidiary of the Chesapeake and Ohio Railway Company, and on May 1, 1987, the B&O merged into the C&O, a wholly owned subsidiary of CSX Corporation.
2/ A bridge structure framed to allow the track to be supported at or near the bottom flanges of the plate girder.
3/ A device that provides a red marker light at the end of a train not provided with a caboose. Additionally, by radio telemetry the end-of-train device provides the engineer a digital readout of the airbrake pressure at the end of the train and of any change in air pressure.

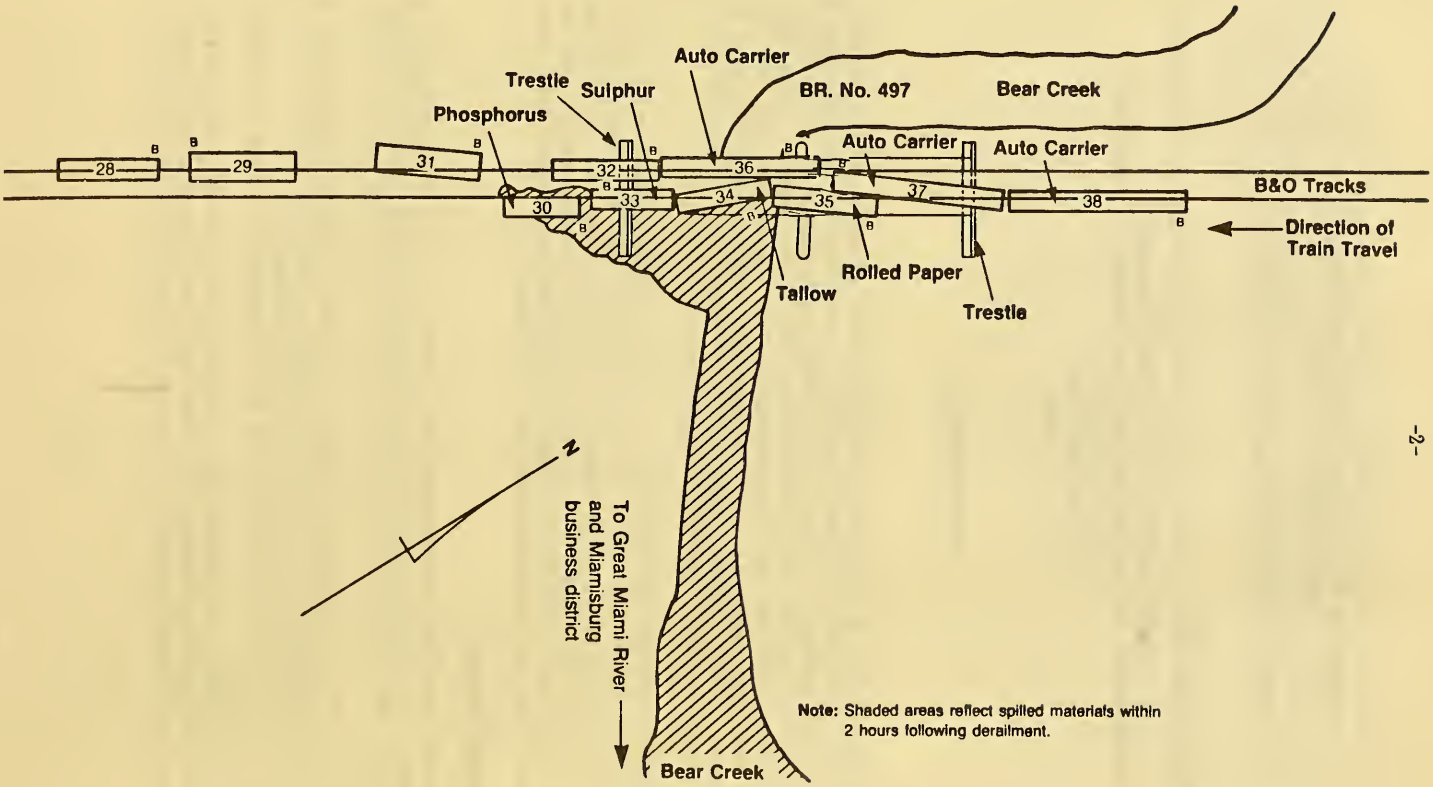


Figure 1.—Derailment site.

top washout nozzle along with the tank shell adjacent to the airbrake support bracket were breached during the derailment and subsequent fire, releasing thick clouds of phosphorus combustion effluents (see figure 2). Liquid phosphorus was released on to the ground through the 8-inch tear in the bottom of the tank shell at the airbrake support bracket attachment. The exposed phosphorus smoldered and ignited within 15 minutes.

The 33rd car, UTLX 76486, a tank car loaded with molten sulfur, began releasing its contents during the derailment just north of the bridge. This car came to rest straddling the south headwall of the bridge and just behind the 30th car. This car received three tank head punctures: the trailing head had a 24-inch-long fracture and the leading head had both a 10-inch-diameter and a 28-inch-long fracture. A large volume of molten sulfur was released through these punctures and spilled onto the bridge and into the creek before the phosphorus ignited.

The 34th tank car, UTLX 77400, containing tallow, came to rest on the south span of the bridge. The leading head had a puncture approximately 12 by 6 inches directly above the draft sill. Tallow was released into the creek through this puncture.

Emergency Response

Immediately after the derailment, the crew observed what appeared to be a dust cloud at the rear. The conductor reviewed the waybills to determine what "Dangerous" 4/ commodities might be involved. The waybills identified two tank cars (the 12th and 30th) as "Dangerous" and listed their commodities as sodium hydrosulfide and yellow phosphorus, respectively. The way bill for the phosphorus tank car (30th) also was marked "Poison." 5/ Shortly thereafter, the conductor and the front brakeman left the locomotive and began walking north along the forward portion of the train. While a crewmember could have approached from the rear safely, no one was sent to the rear of the train to determine which of those rail cars remained upright. Almost concurrently, about 4:29 p.m., a nearby resident telephoned the Miamisburg police/fire dispatcher, and fire and police units were immediately dispatched. A city fire inspector, who was on the Sycamore Street Bridge near the accident site saw smoke coming from the derailed cars at 4:30 p.m.

Shortly after 4:31 p.m., the first arriving local emergency personnel approached within 100 feet of the southwest side of the bridge. These first responders, a policeman and firefighter, reported that because of the thick smoke they could only see two tank cars (the 30th and 33rd) just south of the bridge. They saw the bottom of the 30th car facing west with a tear in its shell; they could not see the condition of the 33rd car. Placards were no longer in place on the ends and sides of the 30th car because they had been torn off during the derailment. Thus, the emergency responders were not alerted that the hazardous materials were involved in the derailment nor did they realize the need to wear personal protective equipment. They reported that "there was a small yellowish-white fire visible within the bottom of the one tank car [30th] and that a large cloud of very thick white smoke was billowing from the hole."

When the conductor and front brakeman proceeded past the fourth car north of the locomotive, they saw billowing white smoke and cars on the ground south of the bridge. The conductor said that because he knew that two cars in the train contained hazardous

4/ Title 49 CFR Section 174.25 requires "Dangerous" to be noted next to the car number on waybills, switching orders, and other billing for most classes of hazardous materials.
5/ Denotes the Canadian subsidiary classification for phosphorus.

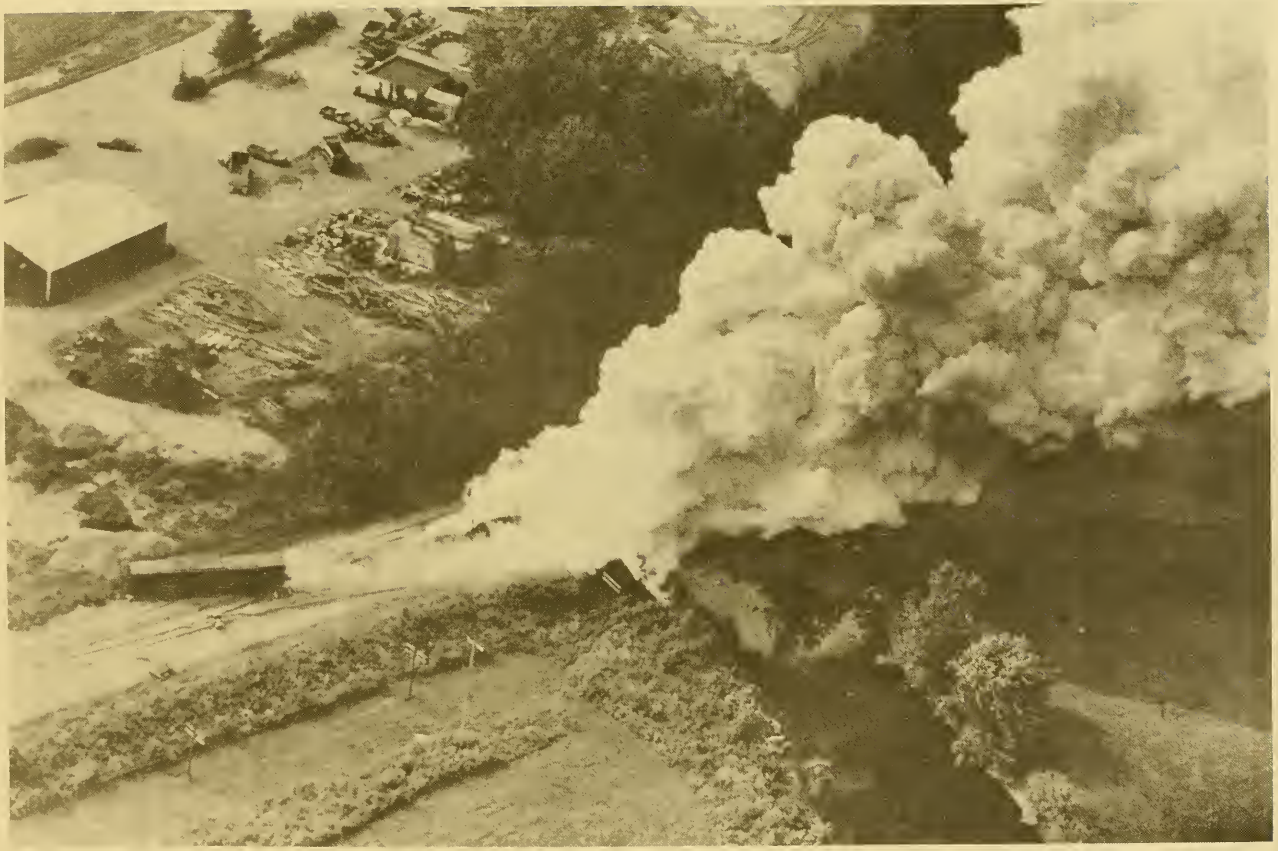


Figure 2.—Cloud viewed from the city east of the accident site.

materials, he contacted the B&O Dayton dispatcher using his portable radio, reported the train's location, and requested local emergency assistance. At this time the conductor was unable to determine if either of the hazardous materials tank cars were involved in the derailment. At 4:37 p.m., the B&O Dayton dispatcher contacted the Miamisburg Police Department reporting "a train derailment on the Chessie System 6/ and west of the Miami River and south of Sycamore Street.

The conductor and the front brakeman continued to walk along the forward portion of the train passing the first "Dangerous" tank car (12th). When they reached the 27th car, the northernmost standing car in the forward portion of the train, the conductor obtained the car number and, referring to the train profile, assumed that the other remaining "Dangerous" tank car (30th) was involved in the derailment. During this time the car numbers of the standing cars were radioed to the dispatcher as the conductor walked toward the south end of the bridge to get additional car information.

Shortly afterward, the conductor approached south of the bridge and met the emergency responders. The conductor advised the emergency responders that "the car on fire was filled with yellow phosphorus which is a poison," and further added that the immediate area should be evacuated. At this time, the intense smoke and heat prevented identification of other cars south of the bridge. The conductor advised that he had the train profile, and the responders requested that he accompany them to the command post. Before leaving with the conductor, the responders noted that within the few minutes they had been observing the accident, the fire in the 30th car had grown and was spilling out of the tank car from a hole in the tank bottom creating an extensive cloud of smoke which was drifting east over Miamisburg.

While en route to the scene, the firechief of the Miamisburg Fire Department was advised that the conductor had identified the burning material from the tank car as phosphorus. The firechief ordered an immediate evacuation of the west side of the Great Miami River. Later, after seeing the direction and size of the cloud, he ordered an evacuation of the northeast section of Miamisburg, approximately 1/3 of the city.

A command post was established approximately 1/4-mile south of the Bear Creek Bridge (on Sycamore Street). At the command post, the conductor provided the firechief preliminary information from the train profile on the materials being transported. The fire department, because of training previously provided by the B&O, expected more information than the conductor provided and requested all information that was carried on the train. The conductor returned to the locomotive, collected the scattered waybills that had fallen to the floor of the locomotive during the derailment, and returned to the command post with the waybills. A "Canadian Emergency Response Form for Special Commodity PHOSPHORUS" 7/ (see appendix F) that included the shipper's 24-hour emergency telephone number, was not among the waybills provided to the firechief at the command post. Because the train's crewmembers had not determined the status of the cars at the rear of the train, the conductor was unable to provide accurate information on the cars involved in the derailment or on the materials contained in the derailed cars. To

6/ The Chesapeake and Ohio Railway Company.

7/ On shipments originating in Canada, Canadian law prescribes a specific form of emergency response documentation to accompany the waybills for hazardous materials moving by rail. According to a representative of CSX, the CSX/Association of American Railroads (AAR) emergency guidance for phosphorus was not made a part of the papers carried on this train to avoid any confusion that might result from having both the Canadian and the CSX/AAR emergency guidance for phosphorus.

obtain the necessary information, firefighters, in full protective equipment, entered the derailment site to document the derailed cars and obtain the numbers of the cars immediately to the south and north of the bridge.

During this time, the B&O assistant chief dispatcher contacted the trainmaster who, having overheard the radio conversation between the conductor and the B&O Dayton dispatcher, was already en route to the site. When the trainmaster arrived at 5 p.m., he observed the general derailment area and the "spilled materials flowing into the Bear Creek." The trainmaster went to the command post and assisted the conductor in his review of the train profile and waybills to confirm the dangerous commodities that might have been involved in the derailment. Following this review, the conductor advised the firechief that the tank cars involved in the derailment contained phosphorus, sulfur, and tallow.

After reviewing the train consist and waybills with the public safety officials, the trainmaster contacted his dispatcher to notify appropriate subcontractors for wreckage clearing and chemical cleanup. Additionally, the trainmaster had his dispatcher contact the Chemical Transportation Emergency Response Center (CHEMTREC) 8/ and obtain guidance for handling phosphorus. According to the trainmaster, he met with the firechief around 6 p.m. and based on information obtained from CHEMTREC, he advised the firechief "not to use water to fight the fire since they could not flood the phosphorus with water and spraying would not put it out." Additionally, the trainmaster stated that he advised the firechief that B&O intended to begin removing the rail cars to permit access to the site. According to the firechief, he did not have this conversation with the trainmaster.

Among the hazardous materials emergency response guidelines available to the firechief on scene were the 1980 and 1984 editions of the U.S. Department of Transportation (DOT) Emergency Guide for Hazardous Materials (DOT guide) and the National Fire Protection Association's (NFPA) "Hazardous Chemicals Data." (See appendix F.) Guide No. 38 of the 1980 DOT guide advised isolating the hazardous area, denying entry, and flooding the area with water to cool the containers exposed to flames. It also advised wearing self-contained breathing apparatus and full protective clothing. 9/ Guide No. 49 of the NFPA guide indicated that when a mixture of sulfur and yellow phosphorus is warmed, the two elements unite with vivid combustion and a powerful explosion. The NFPA guide also advised deluging with water, taking care not to scatter the fire, until it is extinguished and the phosphorus has solidified. Further, this guide advised that it then should be covered with water.

Various fire units and representatives from State agencies began arriving on scene during the evacuation. The firechief consulted with other firechiefs who had responded to the site to obtain their recommendations on what emergency response tactics should be used. Assisting the Miamisburg Fire Department were 14 fire departments from nearby

8/ The Chemical Transportation Emergency Center of the Chemical Manufacturers Association maintains a 24-hour hotline for emergency information and shipper contacts for hazardous material transportation emergencies.

9/ Since 1980 the DOT has made significant changes to the 1980 guide which are reflected in the 1984 DOT Guide. The 1984 DOT guide advises among other things to isolate the hazard area and deny entry, to use water spray or fog for large phosphorus fires, to not scatter material with more water than is needed for fire control, and to use water spray to reduce vapors.

communities and a regional hazardous materials response team. Additionally, the Director of the Miami Valley Disaster Services Authority (MVDSA) assisted in establishing communications and coordinated the activities of the responders.

The firechief wanted to keep all personnel, including railroad personnel, out of the fire area until the fire was under control. The firechief considered the firefighting tactics suggested by the other firechiefs. Because of limited access to the site and because water cannons with direct hose streams were the only available apparatus capable of reaching the burning cars, the firechief said that he had no choice at the time but to fight the fire at a distance using direct hose streams. The trainmaster challenged the authority of the city and the firechief to handle the emergency; he was escorted from the command post under threat of arrest.

Fire engines were moved into position to draft water from Bear Creek and the Great Miami River. About 7:10 p.m., the attack began and approximately 3,500 gallons of water per minute were flowing on to the fire. Because of the DOT guidance that said to avoid the acid fumes, 15-person crews rotated shifted at the four water cannons that deluged the phosphorus tank and spill area. Because of the intense fire and the warnings about the possibility of an explosion and the formation of a highly toxic gas if the spilled phosphorus and sulfur reacted, 10/ the firechief ordered all other personnel out of the area. During this operation, additional unknown amounts of phosphorus, sulfur, and tallow were carried into the creek by the water used to deluge the tank cars. Later, to minimize the release of pollutant runoff from the hose streams into the Great Miami River, a containment boom was placed across the Bear Creek.

While the fire department worked to extinguish the flames, other local agencies coordinated the evacuation of sections of Miamisburg, West Carrollton, and Moraine. When the previously initiated evacuation was completed, an estimated 7,000 persons, mostly from the residential district north of Central Avenue in Miamisburg, were evacuated.

Around 8 p.m. the fire from the phosphorus tank car was no longer apparent, but smoke and flareups continued in the immediate area at the south end of the bridge; commodities on other derailed cars were still burning out of reach of hose streams being used at that time. By 8:26 p.m. smoke was no longer emitting from the phosphorus tank car. With the fire under relative control, the firechief allowed B&O personnel to begin removing the standing cars on the north side of the bridge. While Safety Board investigators could not determine the specific details of the conversation between the firechief and B&O officials, the firechief later said that the believed that B&O had advised that "the sulfur tank car was still on the tracks on the north side of the bridge and an engine was sent down [from Moraine] to transport the sulfur tank car to Dayton." 11/

Later in the evening, emergency specialists representing the shipper, the carrier, subcontractors, and State and Federal agencies arrived in Miamisburg. The firechief met with these representatives and used the information they provided over the next several days to make decisions during the emergency.

10/ The NFPA guide warned about the possibility of an explosion, while a local chemist warned about the possibility of an explosion and/or the possible formation of a deadly gas, phosphorus pentasulfide.

11/ Actually there was an empty tank car, the 43rd car, which was on the north side of the bridge and at the rear of the train.

Shortly after midnight, a B&O evaluation team was allowed to enter the fire scene to assess the extent of damage to the phosphorus tank car (30th) and to determine the amount of phosphorus remaining. During these operations, the B&O confirmed that the sulfur car (33rd), in fact, was on the bridge. This information was provided to the firechief about midnight during an organizational meeting called by the firechief. The evaluation team determined that there appeared to be two holes on the top and an 8-inch hole in the bottom of the phosphorus tank car (30th); they estimated about 4,000 gallons of product remained inside the burning car.

During the first and second day of the emergency, several proposals for handling the emergency relative to the phosphorus tank car were evaluated during meetings at the command post.

Direct Hose Stream Attack.—The B&O and later, on the second day, the Ohio Environmental Protection Agency (EPA) recommended that since the fire from the phosphorus had abated, the direct hose streams should be shut off and a mist be used to control the smoke from the tank car. After several attempts to remove the firehoses briefly, the tank car fire began to rebuild in intensity. Additionally, the B&O advised that the phosphorus tank car was perched on an embankment that was being eroded by the heavy discharge of water. The firechief was aware that a second flareup was possible if the tank car moved, but B&O specialists advised him that the tank car likely would not move. The firechief said that he was unable to move misting apparatus close enough to the tank car to apply a water mist. For this reason, the firechief could not comply with the recommendation, and he ordered continued use of the hose streams to deluge the phosphorus tank car, but he reduced the rate of water flow during the first night.

Plugging.—The B&O initially believed that if the holes in the phosphorus tank car could be plugged, the fire could be extinguished. However, this tactic was not feasible mainly because of the large bottom hole in the tanks shell.

Water Flooding of the Interior of the Phosphorus Tank Car.—The B&O believed that if the tank car was repositioned so that the bottom hole was well above the liquid level, a blanket of water could be injected and possibly smother the fire or seal the remaining phosphorus inside the tank car. However, after several attempts to add water, response personnel saw liquid phosphorus flowing from the top washout nozzle and small shell holes causing the fire to intensify.

Apply Foam.—Tank car specialists recommended that to exclude air from the phosphorus tank car, the car should be covered with a new and improved foam. This plan was never attempted because the fire in the tank car intensified before the foam arrived.

Burial.—Burial was tentatively discussed as an alternate approach should the other methods fail. However, this plan could not be attempted until the fire subsided because to exclude air from the phosphorus tank car, it would have to be moved to a deep pit excavation and covered with sand.

On July 9, 800 residents were still prohibited from returning to their homes in the immediate area of the derailment. At 6:05 p.m. a concrete structure, 12/ not a part of the bridge, that had been supporting the phosphorus tank car sank approximately 1.5 feet due to erosion caused by the large volume of water directed on to the car. As a result,

12/ The concrete structure was identified by CSX as a preexisting structure whose purpose is unknown.

the tank car tilted about 15° to the north and a large amount of molten phosphorus inside the tank car shifted and apparently escaped through the hole in the washout. The fire intensified and released a thick, massive smoke plume. The firechief decided that the fire was beyond control; thus, the hose streams were directed onto the tank car to cool the metal to prevent a massive breakup and thus intensity the fire.

As winds shifted, the large smoke plume was carried east at 6 mph over Miamisburg. Later in the evening on July 9 as the wind subsided, a weather inversion developed causing the cloud to remain close to the ground. The city and surrounding jurisdictions initiated a second major evacuation affecting an estimated 30,000 persons. 13/ The evacuated areas included Miamisburg, West Carrollton, Moraine, Miami Township, and parts of Washington Township. Police departments from 53 jurisdictions assisted in the evacuation of the city and surrounding areas; 12 shelters were opened near Dayton, Ohio.

On July 10, with the prevailing winds at 5 to 10 mph from the south at 135°, the plume was fairly dense and low to the ground. An environmental monitoring station 1 mile northwest of the tank car measured 5.0 mg/m3 of phosphorus aerosol which exceeded the threshold limit of 0.1 mg/m3. 14/

During meetings at the command post on July 10, proposals were discussed to dispose of the estimated 1,000 gallons of phosphorus remaining in the tank car.

Open Manhole.—It was estimated that if air was blown directly into the tank car, the burn rate of the phosphorus would accelerate and consume the remaining 1,000 gallons in about 12 hours. To accomplish this, the manhole cover bolts would have to be removed by cutting, an air blower would have to be put in position, and a 6-inch fan duct would have to be inserted through the manhole to enhance the burn rate.

Explosive Demolition.—The EPA proposed that explosive demolition be used to blow a hole in the car to accelerate the burn rate It believed that this method would be safer than opening the manhole.

The firechief, in consultation with the city manager, decided to proceed with the accelerated burning through the opened manhole because he believed it to be a more controllable process. The rate of interior burning increased when the liquid surface was exposed to the increased volume of air. On July 11 the intensity of the fire was reduced sufficiently and the phosphorus tank car was moved 35 feet to a level position. After 24 hours, the rate of burning decreased sufficiently to allow further inspection of the tank car. It was found that 4 inches of phosphorus residue was "crackling and bubbling" in the bottom of the tank car. Water was poured over the remaining phosphorus to extinguish the fire. The car was then pulled 60 feet to a bed of sand where it was cut open. The remaining product was loaded into drums for disposal. The evacuation order was lifted on July 12, 5 days following the derailment.

To minimize environmental pollution, the area of Bear Creek between the bridge and the Great Miami River was isolated by a barrier dam from July 9 through July 11 and diverted to the north around an area adjacent to the derailment. Approximately 200,000 gallons of water per day were treated for several weeks with hydrogen peroxide

13/ This was reportedly the most extensive evacuation in the United States following a hazardous materials railroad accident.

14/ The threshold limit is the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed day after day without adverse effects.

to neutralize the phosphorus. The water was then filtered through a sandbed before being discharged to the municipal sewage treatment facility. In addition to water treatment, the contaminated soils from the creekbed and railbed were excavated to a depth of 12 to 13 feet. The contaminated soils were placed on an asphalt pad to aerate and mix with hydrogen peroxide. After the soils were treated, they were disposed of at a landfill. Approximately 5,000 cubic yards of contaminated soil were removed over 2 months.

Injuries to Persons

	Crewmembers	Response Personnel	Others	Total
Fatal	0	0	0	0
Nonfatal	0	13	556	569
Total	0	13	556	569

Local hospitals received 569 patient visits 15/ including 27 patients who were hospitalized with complaints relating to the spill; specifically, shortness of breath, burning eyes, and throat irritation. Ten emergency responders were treated for heat exhaustion and inhalation complaints. One firefighter received phosphorus burns on his leg, and two others received minor ankle and head injuries.

Damage

Damage was estimated by CSX as follows:

Track	$ 10,000
Bridge structure	175,000
Signal	3,000
Rail equipment	242,000
Cargo	630,000
Civilian response	480,000
Environmental cleanup	2,000,000
Total	$3,540,000

This loss estimate does not include costs to evacuees, community disruption, or business interruptions.

Meteorological Information

The following average weather conditions were observed at the J.M. Cox International Airport, Dayton, Ohio, 18 miles from Miamisburg, Ohio. From 3 p.m. until 8 p.m. on July 8, 1986, the sky was scattered to overcast with 5 to 6 mile visibility with thunderstorms and light rain (.6 inches); the average temperature was 87° F, dewpoint was 71° F, and the wind was from the southwest at 11 knots.

On July 9, the wind shifted from the southwest to northwest at 7 to 10 knots; there was haze with fog in the evening, and the sky was overcast. From July 10 through July 12, the wind was mostly from the southeast with periods of rain showers and the temperature was in the 70s.

15/ Ohio Department of Health Report—"Miamisburg Hazardous Material Incident: Emergency Room Study," (860726), June 29, 1987.

Emergency Preparedness

On April 14, 1986, the B&O conducted a training session with the Miamisburg Fire Department covering B&O procedures for obtaining hazardous materials assistance and covering information the traincrew will provide in the event of a derailment. Also, the B&O conducted similar sessions with other fire departments in the area during this time.

In large part, initial training was provided from programs sponsored by local industries, the railroads, and other organizations. This training, which totaled 20 hours, included identifying hazardous materials, recognizing and dealing with explosives, dealing with railroad emergencies, and introducing the trainees to specialized hazardous materials equipment. The sources of this training were the Dayton Police Department Bomb Squad, the Ohio State Fire Marshal's Office, the Chessie System, the Detroit, Toledo and Ironton Railroads, and an NFPA-DOT slide program.

During April 1982, six members of the response teams, members of the Dayton Fire Department, Huber Heights Fire Department, Kettering Fire Department, and the Washington Township Fire Department were sent to the Colorado Training Institute for Hazardous Materials to attend an 80-hour in-depth and hands-on program. After they returned from the school, the MVDSA prepared a comprehensive training program for the other members of the response team; the program was prepared and conducted through the end of August 1982. This phase of training totaled some 50 hours of both classroom and practical instruction. It covered the following areas: a refresher course on the proper procedures for identifying hazardous materials; chemical properties of hazardous materials; specialized equipment use and maintenance; containment procedures i.e., plugging, patching, diking, etc.; hazardous material tactical considerations; evacuation procedures; and decontamination procedures. The MVDSA conducts about 20 exercises a year. In August 1984 MVDSA conducted a full-scale exercise involving over 20,000 participants.

Product Information

Yellow Phosphorus.—Yellow phosphorus appears as a pale yellow waxy solid at room temperature with a sharp pungent odor resembling garlic. Yellow phosphorus does not react with water and is stable as long as it is kept submerged or otherwise excluded from air. On exposure to air, phosphorus will begin to heat and smolder, and on reaching 86° F, it ignites. Consequently, phosphorus is transported in insulated tank cars in molten form for ease of unloading and under a thick layer of water to prevent exposure to air. Burning phosphorus produces irritating and toxic combustion products, which may include orthophosphoric acid fumes and phosphorus pentoxide, both are hazardous materials classified as corrosive. Under U.S. hazardous materials regulation, yellow phosphorus is classified as a "flammable solid;" 16/ under Canadian regulations, yellow phosphorus is classified as "spontaneously combustible."

On June 23, 1986, Tenneco Canada, Inc., (ERCO Industries, Ltd.) loaded UTLX 79499 at Varennes, Quebec, with 176,798 pounds (approximately 12,000 gallons) of yellow phosphorus at approximately 130° F and covered it with 25 inches of water. When the tank car was shipped on June 27, 1986, ERCO furnished the Canadian National Railways a certified bill of lading, the required Canadian Emergency Response Form, Plan

16/ Under 49 CFR 173.150, a "flammable solid" is any solid material, other than one classified as an explosive, which can be ignited readily and when ignited, burns so vigorously and persistently as to create a serious transportation hazard. Included in this class are spontaneously combustible materials.

No. ERP2-001 (see appendix F), and ERCO's emergency phone number. The Canadian National Railways prepared the waybill to accompany this shipment to its destination at Albright and Wilson, Inc., in Fernald, Ohio. The waybill described the shipment as "Phosphorus, white or yellow, in water, spontaneously combustible 4.2(6.1)(9.2) 17/ UN1381 Package Group I RQ." The Canadian National Railways added to the waybill the required "Dangerous" placard endorsement (as stipulated under 49 CFR Sections 174.25, and 174.83 through 174.93) along with the "Poison" endorsement which indicated that special handling was required, and assigned Standard Transportation Commodity code (STCC) 4916141 18/ to the shipment. The crewmembers of train SLFR were provided, in addition to the waybill, the Emergency Response Plan No. ERP2-001.

CSX stated that at the time of the Miamisburg derailment, the normal CSX practice was to enclose a document entitled "Emergency Handling Precautions" for that particular commodity and the waybill covering and accompanying a shipment of certain hazardous substances. (See appendix F.) This document describes the basic characteristics of a substance and emergency measures for handling spills, fires, etc. The same information is maintained within the CSX computerized data system and can be accessed via terminals located in CSX offices throughout the railroad including those of dispatchers. The document is generally placed with the waybill at the time the bill is prepared or when the waybill is received with the car in interchange from another carrier. However, when the CSX receives a Canadian-origin car, the Canadian Emergency Response Form or Plan for the particular commodity is retained with the waybill in lieu of adding CSX's emergency handling precautions form. This practice is followed in order to avoid possible confusion that may occur by having two sets of guides covering the same equipment.

Sulfur.—Molten sulfur is sulfur that has been maintained above 245° F and can present toxic hazards either due to the release of entrained hydrogen sulfide, a toxic flammable gas, or due to the release of sulfur dioxide, a product of combustion. Sulfur is not regulated for rail transport and does not require the identification of the hazard class and packaging in transportation under 49 CFR Part 172.

Marathon Oil loaded UTLX 76486 with 197,840 pounds or approximately 13,000 gallons of molten sulfur, and the tank car was shipped on July 2, 1986, from Detroit, Michigan, en route to Dupont, at Fort Miami, Ohio.

The Safety Board previously has directed the DOT's attention to the necessity for classifying and regulating sulfur and other molten materials. Based on its findings on the hazards of molten sulfur as a result of its investigation of a January 19, 1985, highway accident at Benicia, California, the Safety Board recommended the DOT's Research and Special Programs Administration (RSPA):

> I-85-19
>
> Regulate molten sulfur and, as appropriate, other molten materials as hazardous materials, prescribe packaging and handling standards, and incorporate information relating to the hazards of these materials into warning devices and publications available to emergency responders and others involved in the transportation of molten materials.

17/ Under the Canadian hazard classification system the primary (4.2) as well as the subsidiary classification (6.1 and 9.20) are required on the waybill; i.e., primary hazard is "spontaneously combustible," and subsidiary hazards, are "toxic" and "hazardous to the environment."

18/ STCC numbers are seven-digit numbers identifying a specific hazardous materials as indexed in the STCC of Hazardous Materials of the AAR.

I-85-20

Classify as priority action the proposed rulemaking in Docket HM-178 regarding the definition of flammable solid, and establish a timetable for its completion. Include in the final rule test requirements and clear, objective criteria for shippers to identify those materials included in this hazard class.

RSPA concurred in the Safety Board's assessment that molten sulfur should be regulated, and on November 21, 1986, it published a rulemaking (Docket HM-198) proposing to regulate as hazardous materials sulfur and other molten materials. Additionally, on May 5, 1987, under separate rulemaking (Docket HM-181—comments due November 2, 1987) RSPA is proposing the adoption of the United Nations classification for sulfur as "spontaneously combustible." Under Docket HM-198 rulemaking actions, RSPA sought information on other molten materials that potentially posed hazards sufficient for the DOT's regulation and sought comments relative to the extent such materials should be regulated. The Safety Board responded to the HM-198 rulemaking proposal by providing information on additional accidents where nonregulated molten materials posed hazards, and advised the DOT that in assessing the need to regulate molten materials, the DOT should consider the hazards posed by these materials within the various transportation environments. For rail transportation, the Safety Board advised that the hazards presented by the potential chemical interaction between sulfur and other materials also should be evaluated, and it urged the DOT to match the probable consequences of a molten material accident with the necessary safeguards.

Tank Car Information

UTLX 79499.—This tank car was a 12,500-gallon, DOT specification 103W tank car built by UTLX in June 1966. It was specifically designed to transport phosphorus. The car was equipped with 100-ton trucks, type E top- and bottom-shelf couplers, and exterior heater coils. It was insulated with 4 inches of fiberglass protected by a 1/8-inch-thick steel jacket. The car was 39 feet 4 1/2 inches long and its lightweight was 69,000 pounds. The tank had an inside diameter of 98 inches, an inside length of 33 feet 8 1/2 inches and was fabricated from American Society for Testing Materials (ASTM) A285 Grade C steel. The tank head and shell thicknesses were 1/2 inch. The tank had a 20-inch manway entrance, one 2-inch water induction pipe, one 2-inch phosphorous loading/unloading line, one safety relief valve, and two 10-inch top washout fittings. The car was equipped with body-hung brakes 19/ with the brake cylinder and AB valve reservoir attached to two 6-inch-diameter schedule 80 pipes welded directly to the tank shell.

The 2-inch water induction pipe on UTLX 79499 was open, and the B-end top washout nozzle and the tank shell adjacent to the airbrake support pipe were breached during the derailment and subsequent fire. Also, the trailing B-end head received an L-shaped tear at the 3 o'clock position which was 1 1/2 by 3/4 inches with less than 1/8 inch separation in the metal. (See figure 3.)

During the derailment, the leading truck of the tank car hit the south headwall, disengaging the trucks and forcing the lead truck under the center of the car. As the tank car detrucked, the underside attachments of the car were subjected to impact forces in a rearward direction (from the A-end to the B-end) as it slid over debris. These forces, when applied through one of the cylindrical brake supports, generated sufficient bending

19/ Refers to the practice on early design stub-sill tank cars of attaching airbrake equipment directly to the tank shell at the bottom.

Figure 3.—UTLX 79499 as viewed from the east side on July 10, 1986.

moments in the tank shell at the bottom of the tank to tear an 8-inch-diameter hole in the tank shell at the brake support attachment. Next, with the trailing end of the tank car elevated and with the car still in an upright position, a passing car struck the body bolster and trailing tank head puncturing a hole in the trailing B-end head at the 3 o'clock position as viewed from the B-end of the tank car. The tank car then rotated counter-clockwise, came off the bridge, and stopped abruptly at the south end of the bridge.

A 2-inch water induction pipe in the dome was found open with the plug valve missing. There was fire damage to 3/4 inch of the thread at the end of the pipe. Also the B-end washout, which was 10 inches in diameter and 6 inches in height, was damaged over 1/3 of its area.

UTLX 79499 was one of 32 similar DOT 103 tank cars built by UTLX for phosphorus service and manufactured to the earliest stub-sill 20/ design in which the brake supports were welded directly to the underside of the tank. In addition to UTLX 79499, Albright and Wilson, Inc., operates four other tank cars that carry phosphorus. Two of these tank cars were built by UTLX using the stub-sill design with body-hung brakes. The other two were built by General American Transportation Corporation (GATX) which incorporated a full-length center sill to which the airbrakes were attached. Following this accident, UTLX notified lessees of similar UTLX 103 tank cars with the stub-sill design regarding the Miamisburg incident, and many of these cars including those belonging to Albright and Wilson have been voluntarily removed from service and returned for modification. After learning of the Miamisburg accident, the Canadian Transport Commission (CTC) inspected tank cars in Canada and found two similar UTLX tank cars in Canadian service. The CTC ordered both of these cars taken out of service. While the Federal Railroad Administration (FRA) has inspected similar cars in service, it has not required any to be taken out of service nor does it intend to order any modification of similarly equipped tank cars. Rather, it intends to monitor an industry-wide retrofit program being developed by the Association of American Railroads (AAR) for unprotected body-hung brakes.

UTLX 76486.—This tank car was a 13,300-gallon, DOT specification 111A100W4 tank car built by UTLX in 1974 specifically designed for transporting molten sulfur. The car was equipped with 100-ton trucks, type-F 21/ couplers and exterior heater coils. It was insulated with 6 inches of fiberglass protected by a 1/8-inch-thick steel jacket. The car was 43 feet 10 inches long and had a lightweight of 63,000 pounds. The tank had an outside diameter of 101 inches and was fabricated from ASTM A515 Grade 70 steel. The tank head was fabricated of 15/32-inch-thick steel, and the shell was fabricated of 7/16-inch-thick steel. The car was equipped with a stub-sill with the airbrake cylinder attached to the stub-sill reinforcing pad.

Examination of UTLX 76486 disclosed that it had received three end punctures: the trailing head had a 2-foot-long fracture directly above the stub-sill, and the leading head had a 10-inch-diameter and a 28-inch long fracture. Its couplers and draft gears were separated from the tank car while derailing. Nearly 50 percent of the outside jacket and insulation of the tank car had been burned off.

20/ A short longitudinal structural member of a car underframe designed to accommodate the coupler and draft gear and to transmit coupler forces to the car body on cars designed with no through center sill.

21/ The type-F coupler was developed for general freight service and has the interlocking or bottom-shelf feature that restricts vertical motion, thus resisting telescoping and jackknifing in the event of a derailment.

UTLX 77400.—This tank car was a 22,000-gallon DOT specification 111A100W3 stub-sill tank car built by UTLX in 1969. It initially had been designed to transport asphalt. The car was equipped with 100-ton trucks, type-E top- and bottom-shelf couplers, and exterior heater coils. It was insulated with 4 inches of fiberglass protected by a 1.8-inch-thick steel jacket. The car was 51 feet 3 inches long, and its lightweight was 75,600 pounds. The tank had an inside diameter of 113 inches and was fabricated of ASTM A515 Grade 70 steel. The tank head was fabricated of 1/2-inch-thick steel, and the shell was fabricated of 15/32-inch-thick steel. The airbrake equipment was mounted on the draft sill. Examination of UTLX 77400 disclosed a hole puncture in the bottom center of the tank head on the leading end, and the trailing coupler was broken at the bottom knuckle pinhole.

Protection of Attachments.--Tank car manufacturers began to build stub-sill tank cars of the type involved in this accident during the early 1960s. The stub-sill designed for tank cars eliminated the full-length center sill beneath the tank previously used to withstand the forces imposed by trailing loads and to absorb train draft and buff forces generated during train operations not absorbed by the cushioning devices in the stub sill. This design change also resulted in many of the attachments, 22/ once made to the center sill, including the airbrake cylinder and reservoir, being relocated and attached to the tank. For several years at least three tank car manufacturers used a design attaching the airbrake equipment supports directly to the tank car shell. After the cars were in service for several years, it was noted that when a force was applied to an appurtenance as happens during a derailment, the attachment would generate a bending moment into the tank shell that could cause the shell to tear open.

In 1969 due to industry efforts to improve the performance of tank cars in derailments, the AAR Tank Car Committee (see appendix D) required reinforcing pads between the attachment and the tank shell. These pads were required to be at least 1/4 inch thick and to have a breakaway design capability. Concurrently, the subject of impacts on tank shells and various appurtenances including tank fittings and attachments for the various tank cars came under AAR study. The AAR also petitioned the FRA to require similar protection for attachments on new tank cars tanks. In 1971 the FRA changed its regulations on attachments as petitioned by the AAR, applicable only to new tank cars built after 1971. In effect, more than 4,000 tank cars with brake equipment supports directly welded to the tank were "grandfathered" by these requirements and were allowed to remain in service unaltered.

In 1972 the Railroad Tank Car Safety Research and Test Project (Project), Railway Progress Institute 23/ (RPI)-AAR cooperative program, completed its assessment of the behavior of tank car tanks and their appurtenances in the mechanical environmental of accidents. 24/ Its findings, based on a review of 1965 through 1970 accident data, showed that when bottom discontinuities were struck, they acted as levers and tore the bottom of the tank shell. While these data indicated that bottom fittings and attachments both were vulnerable during derailments, the project found that the failure of bottom fittings

22/ Appurtenances attached to the tank shell and heads which are not associated with openings through the vessel wall are tank attachments. Appurtenances attached to the tank shell that are associated with openings through the vessel wall are tank fittings and included items such as bottom outlets and washout gauging devices, top unloading nozzles, and relief valves.

23/ Railway Progress Institute is an association of railcar and component manufacturers.

24/ RPI-AAR Final Phase 09, "Report on Tanks, Fittings, and Attachments in the Mechanical Environment of Accidents," February 15, 1972.

accounted for the greater number of material releases from tank cars. The project's assessment confirmed that the brake support bracket problem was primarily due to the absence of a reinforcing pad. The project also identified additional considerations including the need for local stress relief to compensate for problems that occur when welding a bracket that supports a heavy load to the tank shell. These problems were left to the car builders to handle, and as a result, the project did not recommend additional requirements for design of attachments. It did, however, recommend that the behavior of tank car fittings in accidents be docketed by the AAR Tank Car Committee for continued study.

After the tank car manufacturers began following the AAR's requirements for installing reinforcement pads, metal fatigue problems were experienced with the 1/4-inch-thick airbrake reinforcement pads. All but one car builder used shell plate metal for making their pads, consequently the pads were greatly in excess of the 1/4-inch minimum thickness and these pads experienced no problems. The AAR later negotiated with the one tank car builder to use pads of equivalent shell-plate thickness. The AAR neither repetitioned or otherwise advised the FRA to change its tank car specifications nor proposed additional design or fabrication requirements of its own for increasing the required reinforcement pad thickness. Rather, the AAR relies on the tank car approval process to ascertain that adequate thickness pad is being specified.

In 1974 the Tank Car Committee of the AAR approved protection specifications for bottom outlets, washout, and sumps (discontinuities) for new stub-sill pressure cars (classes 112A and 114A and the proposed class 120A). Concurrently, the subject of bottom outlets on existing stub-sill tank cars came under study. In 1977 the committee developed protection specifications for bottom fittings on new nonpressure stub-sill tank cars. As of January 1, 1978, all newly built, low-pressure (less than 100 pounds working pressure) stub-sill tank cars have been required to have bottom discontinuity protection if the bottom discontinuities extended more than 1 inch. In 1980 the AAR committee required protection of bottom discontinuities on existing class 112 and 114 stub-sill tank cars used to transport liquefied gas or anhydrous ammonia. To develop a schedule of priorities for retrofitting other existing tank cars with bottom discontinuity protection, the committee appointed a task force of representatives from the railroads, the Compressed Gas Association, the Chemical Manufacturers Association, the RPI, and the AAR's Bureau of Explosives (B of E). The task force developed specifications to require protection of bottom discontinuities on existing nonpressure, stub-sill tank cars used to transport certain hazardous materials as listed in the eight AAR commodity groups. The dates by which this protection must be provided were established for each AAR commodity group with all protection required to be completed by July 1, 1990. None of these protection requirements affected attachments to tank cars.

In it 1979 report which reviewed the FRA's hazardous materials program 25/ the Safety Board recognized the progress made by the AAR for protecting bottom outlets. However, because it recognized that the failure of bottom outlets was only one of several tank car appurtenance failures capable of releasing hazardous materials from tank cars during derailments, on March 20, 1979, the Safety Board recommended to the FRA:

25/ For more detailed information, read Safety Effectiveness Evaluation—"Review of the Federal Railroad Administration Hazardous Materials Program and the Applicable Track Safety Standards" (NTSB-SEE-79-2).

R-79-24

In cooperation with the [AAR's] Inter-Industry Task Force, determine what additional cost effective steps, based on risk-ranking results, can be taken to make tank cars more resistive to hazardous materials releases in derailments.

On October 12, 1979, the FRA responded that it was working closely with the AAR/RPI Project which was directed at making tank cars more resistant to hazardous materials releases in derailments. The Safety Board advised the FRA on May 12, 1980, that its response failed to address the specifics of the recommendation. Additionally, the Safety Board advised the FRA that Safety Recommendation R-79-24 would be classified as "Open—Unacceptable Action" until the FRA provided a response that addresses the specifics of the recommendation.

In its 1980 special investigation report 26/ the Safety Board examined the behavior of derailed tank cars equipped with Safety Board-recommended shelf couplers, head shields, and thermal coatings and compared their performance with tank cars not so equipped. The report concluded that the recommended safety devices were effective in minimizing the release of hazardous materials from tank cars so equipped. Further, the report concluded that the majority of the breaches in the tank cars resulted from damaged tank car appurtenances, primarily top fittings and bottom outlets.

In conducting its investigation, the Safety Board reviewed the actions being taken by both the industry and the FRA. It was determined that the industry had proven the technological feasibility for protecting bottom fittings (outlets) and had begun a program to do so; however, the protection of top fittings had not received comparable attention although the same technology could be applied to them. With respect to the efforts of the FRA, the Safety Board determined that the FRA was not obtaining information on the breach mechanisms of tank cars during derailments to assess the safety benefits or liabilities of the regulations for tank car modification. The Safety Board also found that data being collected by the AAR/RPI on form BE/RA-49-79, "Owners Tank Car Damage Report," neither documented the method of product of loss nor the events that caused the release. Based on its finding that the FRA had not collected data on the effectiveness of tank car protection nor had it documented how tank car product loss occurs in tank car accidents on May 8, 1980, the Safety Board recommended to the FRA:

R-80-14

Cause data to be collected on tank car derailment behavior to identify control methods, and incorporate findings in new car construction.

On July 18, 1980, the FRA, responding to Safety Recommendation R-79-24, stated that it believed that the Inter-Industry Task Force could play a part in the process of determining proper modifications to tank cars to reduce the incidence of hazardous material releases in derailments. The FRA further advised that it had been working with the Project since 1972. The FRA believed the Project was the key body for achieving results because the Project, as opposed to the Inter-Industry Task Force, had the required knowledge, expertise, and ability to bring about necessary improvements in tank car safety.

26/ For more detailed information, read Special Investigation Report—"The Accident Performance of Tank Car Safeguards, March 8, 1980," (NTSB-HZM-80-1).

On August 8, 1980, in response to Safety Recommendation R-80-14, the FRA advised the Safety Board that it was researching and testing the mechanisms involved in the breaching of tank cars, but it provided no details on these efforts. The Safety Board classified this recommendation as "Open--Unacceptable Action" and informed the FRA that its reply failed to address the recommendation in that no action was cited relative to the FRA's collection and use of data or identifying breach mechanisms.

In its June 8, 1981, followup letter to the FRA on several recommendations including R-79-24, the Safety Board noted that the Inter-Industry Task Force had been dissolved. However, before dissolution a System Safety Analysis Subcommittee had been established under a cooperative agreement between the AAR and the Chemical Manufacturers Association to continue analyzing available rail accident data to make certain that the findings from the analyses were translated into increased rail safety. The Safety Board acknowledged the FRA's statement that the FRA had been working jointly with the Project to develop cost-effective improvements to tank cars and requested the FRA to keep the Safety Board informed about progress made. In the interim, the Safety Board classified Safety Recommendation R-79-24 as "Open—Acceptable Alternate Action."

On July 14, 1982, in response to Safety Recommendations R-79-24 and R-80-14, the FRA advised the Safety Board that the AAR had voluntarily established retrofit requirements for bottom outlet protection of all stub-sill tank cars that transport hazardous materials. Because of extensive voluntary actions, the FRA advised that it did not believe that regulations for bottom valve outlet protection were warranted. The FRA further advised that its review of accident data concerning the protecting of top fittings did not indicate sufficient justification for further regulations; however, it advised that the industry was considering the establishment of limitations of their maximum height. The Safety Board evaluated these two actions as a good-faith showing by the FRA that it was concerned about the consequences of appurtenance failures and that it was active in seeking improvements. Therefore, on October 4, 1982, the Safety Board classified Safety Recommendations R-79-24 and R-80-14 as "Closed—Acceptable Action."

On May 2, 1980, following two accidents involving airbrake attachments, the Seaboard Railroad (SBD) (now a part of CSX) requested the AAR to again review the accident history of cars with brake support equipment welded directly to the tank shell. The SBD reported that as a result of a 21-car derailment at Buckhead, Georgia,on April 19, 1980, the brake equipment of a liquefied petroleum gas (LPG) tank car was torn off leaving two holes in the shell about 11 inches in diameter. Immediately following the derailment, the LPG burst into flames and burned for 4 days. The SBD investigation determined that the use of a reinforcing pad between the tank shell and the brake support could have prevented the LPG release and fire. The SBD added that "this situation is no different from having bottom outlet broken off in a derailment and should be treated similarly." SBD added that in 1973 it experienced an incident in which a tank car lost its airbrake support brackets.

The AAR referred this request to its Tank Car Committee which responded to the SBD:

> Union Tank Car Company built 1,842 tank cars between 1963 and 1966 with similar brake equipment support arrangements and voluntarily discontinued using this design. Since there were no AAR or DOT requirements prohibiting such arrangements at that time . . . it was the opinion of the subcommittee that remedial action is not warranted at

this time since a large number of similar tank cars have been in service for so many years without experiencing similar damage. The Buckhead incident is the only reported puncture associated with this design.

In 1983, the RPI/AAR Project made an assessment 27/ of the 1965 through 1980 AAR accident data and found that 20 tank cars had released hazardous materials due to attachments failures; 8 of the 20 attachment failures were at brake supports. However, the Project again maintained that there had been so few cases where attachment failure had been involved that no attempt had been made to examine the damage and design in detail in order to estimate if a change would have prevented the tear.

As a result of the Miamisburg incident, the AAR Tank Car Committee has changed its viewpoint in regard to protecting bottom attachments. The committee has now required a retrofit of the existing fleet of 3,630 tank cars that were built with unpadded body-hung airbrake attachments. Specifically, the committee now has approved proposals to modify the tubular brake equipment supports on a product hazard basis, beginning with the pressure cars and progressing through the material hazard rankings until, at the end of a 5-year-period, the entire group of cars would be modified, down-rated to carry nonregulated commodities, or scrapped. The modifications would consist of replacing the airbrake support bracket with a pad and new pipe designed to safely break away. The committee has also initiated a study of its accident review procedures and a study of the Project's 1972 and 1983 reports for possible future activity.

Development of Tank Car Safety Standards

Tank car safety problems identified during the Miamisburg accident and in previous Safety Board investigations of accidents at Marshville, North Carolina; North Little Rock, Arkansas; Elkhart, Indiana; and Seattle, Washington; 28/ and other accidents all combined to prompt a Safety Board review of the process by which tank car safety standards have been developed and how deficit conditions are identified and corrective actions implemented. The Safety Board reviewed the history of tank car development, studied the Federal and industry safety standards for tank cars, and formed an investigative group consisting of the FRA, the AAR, and the CTC to collect information on the procedures used by each agency in formulating safety standards for tank cars. On April 9, 1987, the group met to discuss the tank car safety programs and to identify interactions among those agencies. Appendix D contains a description of the FRA delegations of authorities to the AAR for tank car safety, a description of the present AAR processes for implementing these delegations, and a description of the monitoring performed of the AAR processes.

Initial Tank Car Safety Program.—Early development of tank car safety standards began when the Interstate Commerce Commission (ICC) was authorized by a 1921 law (41 Stat. 144) to use the services of the ARR's Bureau for the Safe Transportation of Explosives and Other Dangerous Articles (now the B of E) for carrying out its

27/ RPI-AAR Phase 02, "Report on Analysis Non-Pressure Tank Car Behavior in Accidents," March 24, 1983.

28/ For more detailed information, read Railroad Accident Reports—"Seaboard System Railroad Freight Train FERHL Derailment and Fire, Marshville, North Carolina, April 10, 1984," (NTSB-RAR-85-5); "Hazardous Materials Release, Missouri Pacific Railroad Corporation's North Little Rock, Arkansas, Railroad Yard, December 31 1984," (NTSB-SIR-85-3); "Anhydrous Hydrogen Release from NAIX 9408, Train No. BNELY3Y at Conrail's Receiving Yard, Elkhart, Indiana, February 4, 1985," (NTSB-HZM-85-3).

responsibilities for developing tank car safety standards. A 1979 U.S. Senate report, 29/ reviewing and analyzing the DOT's hazardous materials transportation safety regulatory program, stated, "The ICC took this Congressional authorization literally; it practically turned the hazardous materials transportation safety program, including tank car safety standards, over to the AAR's Bureau of Explosives."

In 1960, the ICC law was amended (Public Law 86-710) by among other changes authorizing the ICC to use the services of carrier and shipping associations in its hazardous materials safety program. Again, according to the 1979 report, "The ICC took this authorization literally, turning to the trade associations particularly in the development of the requirements for the larger containers, such as tank cars and tank trucks." The report stated that the ICC did not have sufficient expertise to analyze the industry recommendations and the ICC did not establish criteria or procedures to guide the industry in its development of standards. Generally the ICC accepted without question the industry-developed standards.

FRA Tank Car Safety Program.--In 1966 the U.S. Congress created the DOT and transferred to it all safety regulatory authority for the transportation of hazardous materials formerly vested in the ICC, the Federal Aviation Administration, and the U.S. Coast Guard. However, the delegations of authority to industry organizations and the existing industry-oriented framework in which most of the regulations for the transportation of hazardous materials had evolved remained essentially unchanged.

By the time the hazardous materials safety program of the ICC was transferred to the DOT, the ICC had delegated hundreds of responsibilities to the AAR, among them the responsibility for tank car safety. Responsibility for carrying out the DOT's authority over tank car safety was assigned to the FRA, and it continued the delegations of authority made by the ICC. The FRA continued to have exclusive responsibility for tank car safety standards until July 1975, when the Secretary of Transportation created the Materials Transportation Bureau (MTB) 30/ and designated it as the lead agency for the DOT's hazardous materials transportation safety program. Its responsibilities now are administered by the RSPA. While the MTB was given responsibility for issuing all regulations affecting the transportation of hazardous materials, the initiatives for developing regulations applicable to a single mode of transportation was left with the modal DOT administrations; thus, the FRA continued to be the responsible agency within the DOT for rail tank car safety standards.

Since 1966 RSPA has withdrawn from the AAR and others more than 500 delegations of authority; however, the FRA has continued virtually unchanged the delegations of authority to the AAR for tank car safety. Like the ICC, the FRA did not establish criteria or substantive procedures to guide the AAR in its implementation of the delegated authorities.

The regulations (49 CFR 179 and 173.31) include the DOT's specifications for tank cars; delegations to the AAR for approving designs, materials, construction, conversion, and alteration of 10 cars; certification requirements; provisions for service trials 31/ of

29/ Congressional Research Service, Library of Congress, "Hazardous Materials Transportation: A Review and Analysis of the Department of Transportation Regulatory Program," April 1979.

30/ The MTB no longer exists. The hazardous materials responsibility previously managed by the MTB was made a responsibility of the Office of Hazardous Materials which was a suborganization of the MTB.

31/ These service trials refer to a DOT exemption process and are different from the "AAR service trials of values and fittings" that were allowed under the regulations.

tanks and equipment that do not conform to DOT regulations; delegation to the AAR for developing recommended changes or additions to the DOT specifications for tank cars; and some general actions to be taken by the AAR in carrying out the delegations of authority. For example, the car builder must build the car according to the approved drawing and follow requisite AAR-specified inspections. The regulation requirements do not address matters such as the qualifications or interests represented by persons serving on AAR committees that carry out the delegated responsibilities, the procedures or analyses to be followed by AAR committees in making determinations about the adequacy of designs and modifications approved to meet public safety needs, the documentation requirements in support of decisions made, or other procedural matters related to the implementation of the delegated authority. The regulations establish only one requirement for the AAR to report to the DOT the actions it has taken under the delegated authority — to report its recommendations about proposed changes or additions to DOT specifications for tank cars. The FRA does not have procedures for monitoring the actions taken by the AAR under the delegated authority.

The Safety Board previously directed the FRA's attention to the fact that neither the FRA nor its delegated agent, the AAR, inspects the work of tank car manufacturer's to determine if tank cars are being constructed in compliance with DOT regulations and AAR Tank Car Specifications. Based on its findings as a result of its investigation of a December 31, 1984, ethylene oxide release at North Little Rock, Arkansas, the Safety Board recommended that the FRA:

R-85-99

Institute an inspection program to verify that tank cars intended to be used in hazardous materials service are manufactured in compliance with Department of Transportation standards.

On February 18, 1986, in response to Safety Recommendation R-85-99, the FRA advised the Safety Board that it was working on a plan to address the inspection of tank cars during their manufacture and that when the plan was complete, it would be provided to the Safety Board. On December 2, 1986, the FRA provided a copy of a proposal to perform a review of the AAR Tank Car Committee process and of new construction, repair, and alteration facilities for tank cars. This proposal included the following list of "points to be reviewed," which provides insight into previous actions by the FRA for monitoring the activities of the AAR in carrying out the FRA-delegated authorities:

- Are applications for tank car construction and modification complete?
- Is the review thorough, and is there a procedure or form used as a check list to assure that all pertinent information has been furnished on the application?
- How often does the committee meet?
- How often are AAR-certified shops inspected?
- How does the Tank Car Committee decide what is to appear on their dockets for discussion?

- Is there any procedure established to inform RSPA/FRA of possible problems in specific design issues or other matters that would be of concern pertaining to safety (i.e., cracking of stub-sills, corrosion, etc.)?
- Who decides when a docket is satisfactorily completed? Is it by majority of all voting members?
- Does one negative vote reject an application, certification, or docket issue?
- How are materials, appurtenances, gaskets, valves, etc., approved?
- Are outside consultants used in evaluating tank car designs, materials, appurtenances, etc.?
- What criteria are used to nominate committee members?
- How often are Chairmen chosen and what is the procedure?
- Is there any mechanism to remove a committee member who is not producing satisfactorily?

As a part of the FRA committee's current actions during 1987, answers to these questions are to be obtained by reviewing the AAR's Washington office records and procedures, interviewing at least two Tank Car Committee members, inspecting at least two tank car manufacturing/repair facilities, and inspecting the procedures used by two major tank car builders for submitting to the Tank Car Committee for approval of applications for construction of tank cars and for repairs or alterations to tank cars. The FRA estimated that this review would be completed the fall of 1987.

The Safety Board was provided during its review, an August 27, 1986, letter from the FRA's chief counsel to the AAR which discussed the nature and scope of the major delegations to the AAR Tank Car Committee under the DOT's regulations.

> The Department's authority under the Hazardous Materials Transportation Act to "issue regulations for the safe transportation in commerce of hazardous materials, 49 U.S.C. §1804," rests with the Research and Special Programs Administration. RSPA has delegated certain specific functions to the Tank Car Committee, e.g., 49 C.F.R. §179.3.
>
> There are two general characteristics of such delegations. First, any action by a delegate acting in that capacity is wholly circumscribed by the scope of the delegation. Thus, any act putatively within the delegated capacity, but actually outside the scope of the delegation, is without legal affect. Second, since delegations are revocable at any time, publication of a notice of proposed rulemaking revoking a delegation is not required if the delegation is published in the Code of Federal Regulations.

The letter then described the FRA's understandings of the delegated authorities.

> It is especially significant that the Department has delegated to the Tank Car Committee the responsibility to approve or reject an application for the design, materials and construction, conversion or alteration of tank car tanks based on the provisions of 49 C.F.R. Part 179, Specifications for Tank Cars.

The letter explained that the Tank Car Committee exercises no discretion in the referenced approval process since any application in compliance with effective regulations and specifications "will be approved" and any applications not in compliance, cannot be approved; for these, the committee could only recommend service trials.

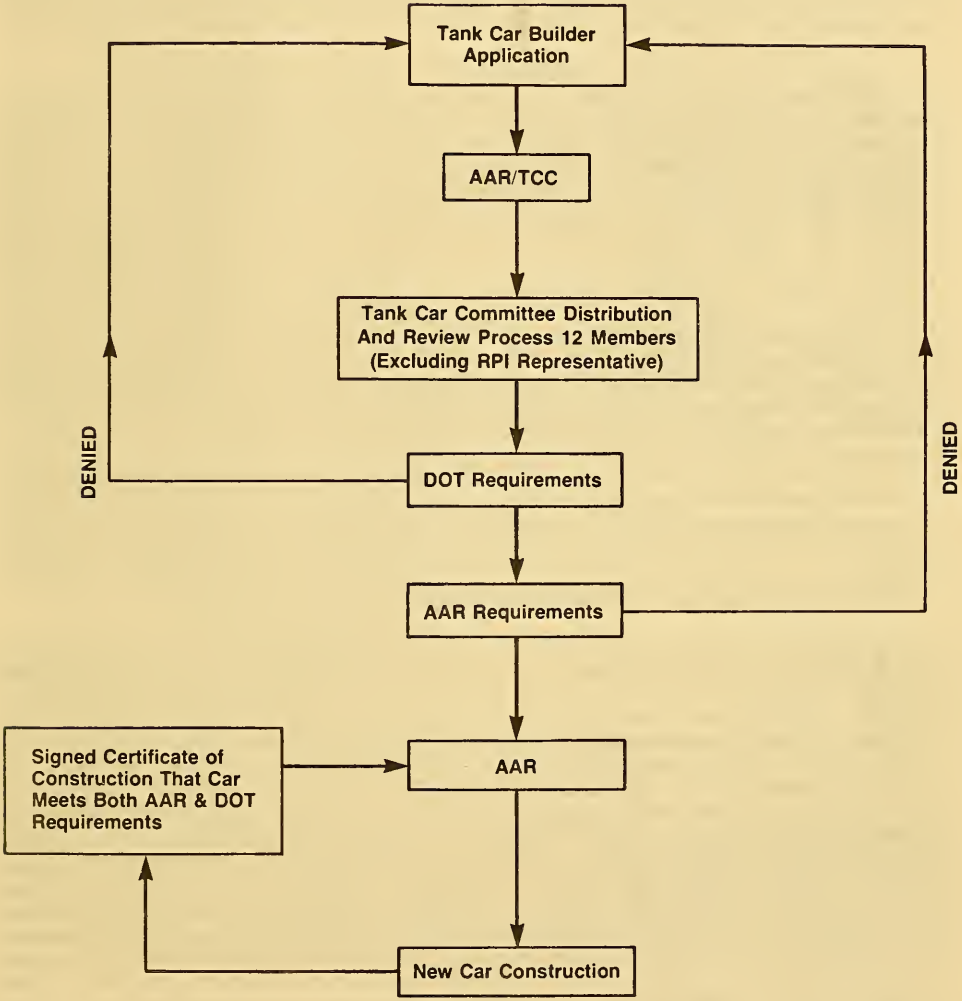
The FRA chief counsel noted that even should the Tank Car Committee approve a noncomplying application, this does not permit the person receiving the approval to violate the DOT's specifications by issuing a certificate of compliance for a tank car when the tank car does not meet the DOT's specifications. The Tank Car Committee's actions under the delegated authority were characterized as serving the interests of the DOT in using its expertise to screen out noncomplying applications. The letter specifically pointed out that a tank car builder may not use the Tank Car Committee's approval to operate a tank car that violates DOT specifications, and that the DOT is free to act to correct an improper Tank Car Committee approval.

The FRA's general counsel described other delegations to the Tank Car Committee as having the authority "to approve designs or materials other than those specifically prescribed by a particular rule." It was noted that "such delegations vest discretion in the Tank Car Committee, but only as to the specific subject covered by that Section." Additionally, by FRA adoption of appendix R of the AAR Tank Car Manual, repairs and alterations of tank cars performed in accordance with appendix R are also governed by AAR-developed procedures.

During the April 9, 1987, meeting conducted by the Safety Board, the FRA advised that it currently was reviewing the AAR operations. Other than the present review, the FRA monitored AAR under the FRA-delegated authority by reviewing FRA accident/incident data; inspecting tank car facilities (begun in 1983); attending AAR Tank Car Committee and Hazardous Materials Steering Committee meetings; and communicating daily with the AAR both by telephone and through written communications regarding a variety of safety issues. However, of the three representatives of the FRA attending the April 9, 1987, meeting, none could attest to any actions by the FRA for reviewing the records of the AAR or for monitoring the various delegated activities carried out by the AAR since 1976, the earliest time any of the three had responsibilities for tank car safety. Also, none of the representatives could recall written procedures or an FRA policy for monitoring the activities of the AAR as they relate to the delegated authorities. Finally, the AAR representative at the April meeting could not recall any requests by FRA representatives to review AAR records or to monitor the Tank Car Committee activities.

AAR Tank Car Safety Program.—The Tank Car Committee is the entity in the AAR responsible for carrying out the FRA-delegated authorities on tank car safety. The Tank Car Committee bases it approvals of tank car designs, modifications, and alterations on current DOT and AAR requirements. (See table 1.) The Tank Car Committee also is charged with reviewing requests for changes or additions to the specifications for tanks, considering the recommendations of its Subcommittee on Specifications, and reporting its recommendations to the DOT. (The DOT regulations, as a part of its delegation to the AAR, require that the Subcommittee on Specification review proposals for new tank

Table 1.—AAR/TCC Flow Chart - Application for Approval of Tank Car Construction



specifications and make recommendations to the Tank Car Committee on proposed additions and changes. Although incorporated within the requirements of the delegated authority, this Subcommittee was abolished in 1972 under a structural reorganization effected by the AAR's Director of Technical Committees. The AAR representative advised that "this subcommittee had functioned at least since 1956 as the total group of interested parties who formulated proposed revisions to the Specifications for Tank Cars for review and approval by the Tank Car Committee." The AAR representative added that this group is still in place and is now called "Subcommittee 1 and 2, Working Groups" and are studying proposals in specialized areas.)

According to the AAR, members of the Tank Car Committee must have direct technical expertise in hazardous materials transportation and are appointed by the General Committee of the ARR's Mechanical Division from nominations made by railroads and others. (The AAR representatives stated that qualified individuals representing general public interests could be appointed; however, such a nominee has never been considered.) The AAR now authorizes the Tank Car Committee to have 16 voting members (10 from railroads, 1 from RPI, and 5 from chemical manufacturers and tank car owners and 1 representative of the AAR's B of E, who is a nonvoting member. This organization reflects recent changes of the committee developed to strengthen the railroad industry's influence in the tank car standards, to provide railroad industry experience on all aspects of tank car safety rather than soley tank design, and to ensure more active participation by the railroad members. The voting members vote "according to the dictates of the technical expertise they possess as related to the issue before the committee." The AAR's recent changes in this committee's structure also included a requirement that the chairman be selected from the railroad membership and added a cochairman who also must be selected from the railroad membership.

The AAR stated that its procedures for the Tank Car Committee are conducted by Robert's Rules of Order, agendas for meetings are prepared and distributed, and minutes of the meetings are recorded. For items to be considered by the committees, there must be a quorum or simple majority of voting members present. Items are approved when a majority of members present consent. There are no limitations concerning the number of members on the Tank Car Committee who represent the same organization.

In 1986 and previous years, the Tank Car Committee was authorized to have 13 voting members any of whom could serve as its chairman. The B of E had a nonvoting member. Seven members were required to be selected from railroads, one from the RPI, and the remaining five from nonrailroad trade organizations. This organization was believed to provide a reasonable balance: the railroads are responsible for the safe transportation of hazardous materials and in general are economically responsible for the effects of releases; the shippers and owners of tank cars may desire to maximize the amount of product that can be transported in tank cars given the gross weight limitations imposed by the rail system design; and the tank car builders are responsible for the design and manufacture of the tank cars. The AAR representative stated that trends in the voting had been noted wherein some of the railroad members were not active in reviewing and voting on the 400 to 800 applications that are handled by the Tank Car Committee every year by mail. To secure approval by letter ballots 32/ for constructing tank cars on a timely basis, AAR staff sometimes had to actively solicit railroad member votes since at least one railroad member had to vote for the ballot to represent a majority of the voting members. Inactivity by the railroad members in voting on these letter ballots

32/ Tank Car Committee approval of an application by mail requires both a majority vote and no negative ballots cast by the members.

could result in an item being approved by members representing chemical manufacturers and tank car owners.

The AAR representative stated that the railroad members are fully informed and active in voting on major issues at Tank Car Committee meetings. The representative further noted that at meetings when a majority of voters approved an item, but the approving votes were not balanced among the varied interests, approval of the item normally would be withheld by the direction of the chairman until the proposal could be modified and a consensus achieved.

Safety Board requests made in March 1987 to inspect AAR records as a part of its investigation were denied by the AAR. Later, limited access was granted and the AAR explained that it had hesitated primarily because no one outside the AAR had ever requested to review these records; thus, it had never formulated a policy on allowing others to have access to its records. Minutes and other records of the Tank Car Committee now are available to qualified Federal government representatives for review; however, this policy was only established by the AAR after the Safety Board made its March 1987 request.

The Canadian Transport Commission

Primary responsibility for railroad tank car safety in Canada is vested in the CTC. It, like the FRA, has delegated responsibilities to the AAR Tank Car Committee, tank car owners, railroads, shippers, and other organizations such as the Chlorine Institute, Canadian Compressed Gas Association, Canadian Fertilizer Institute, and the Propane Gas Association. The CTC adopts as its requirements most of the provisions of 49 CFR Part 179 on tank car specifications; however, for tank cars in Canadian service, it goes beyond these requirements by:

- requiring full head shields on newly built pressure tank cars where head protection is required;
- prohibiting the use of ASTM A515 steel in its present form on any newly built tank cars;
- requiring thermal insulation on cars carrying most of the liquefied gases; and
- requiring an orange colored bank on certain compressed gas tank cars to assist in identifying these tanks cars.

Identification of tank car deficiencies and determinations about safety improvements usually occur as a result of accident and incident investigations and as a result of independent actions taken by the CTC based on information gained through public hearings or information developed on perceived safety threats. Safety improvements identified are implemented by ordering retrofits or, when a tank car manufacturer is cooperative, by periodically monitoring the progress of voluntary actions taken.

The CTC presently inspects tank car manufacturers infrequently and usually does so as a result of accidents or incidents; however, the CTC is formulating a formal program for determining that manufacturers comply with its regulations. The CTC advised that its interface with the AAR and the FRA was informal and irregular, that the CTC had only

limited access to any AAR records, and that the CTC had never attempted to obtain any FRA records officially. However, the CTC representative participating in the Safety Board's review of the tank car safety programs expressed the CTC's believe that the interface among the CTC, the FRA, and the AAR should be formalized and strengthened to identify and resolve common safety problems associated with tank cars. Common safety problems cited as requiring coordinated efforts among the three agencies were: (1) improving safety relief valves in anhydrous ammonia service; (2) providing reinforcement pads on some tank cars; and (3) improving the quality of workmanship in some tank car shops.

In its February 26, 1987, resolution to the CTC, the Canadian Immediate Response to Railway Accidents Technical Experts (IRRATE) 33/ supported the view that increased cooperation among the CTC, the FRA, and the AAR was necessary for improving tank car safety. That resolution called for:

> . . . a serious attempt to be made to form a joint regulatory group between Canadian and U.S. authorities which should review the adequacy of the regulations periodically, assess proposals for any regulatory changes, and assure that any changes are implemented in the same manner and at the same time by the regulatory authorities of Canada and the U.S.

Findings from an investigation on the February 28, 1984, failure of a tank car at a railroad yard in Vaughan, Ontario, Canada 34/ greatly influenced the efforts of the CTC to formalize a monitoring program for covering the responsibilities of the AAR and others. The tank car failure in Ontario resulted from the propagation of a preexisting welding-related defect that occurred during the manufacture of the tank car but was not detected by tests and inspections performed before the tank car was placed in hazardous materials transportation service. Since the failure involved problems potentially related to the performance of rail-related industry groups in carrying out delegated responsibilities, the investigation also looked at the CTC's regulatory program of CTC and at its monitoring of the delegated authorities.

The investigative effort recognized that Canadian action by itself would not effectively provide the measures necessary to ensure public safety. It also recognized that many tank cars were in daily use transporting hazardous materials to and from the United States and that the CTC with its limited resources likely would be unable to effectively monitor delegated activities performed outside of Canada. Consequently, CTC concluded that it needed to develop an arrangement with "those in authority, and those involved in tank car manufacturing in the United States as well as in Canada in order to ensure consistency of control over-border tank car usage."

Appendix G provides the investigative report discussing the CTC's relationship with the AAR. In part this segment of the report concludes:

> Recognition that the performance standards for all safety devices and tank car retrofit proposals requires re-evaluation on a cost/benefit/risk basis;

33/ Resolution: Immediate Response to Railway Accidents Technical Experts (IRRATE), Item 2-87, February 26, 1987.
34/ Report of the Inquiry into the Failure of Tank Car UTLX 98646 on February 28, 1984, in the Canadian National Railway Company's MacMillan Yard, in the Township of Vaughan, Ontario.

Identification that the CTC needs to have liaison with the FRA, the AAR, and others whose actions affect tank car safety;

Recognition that the initiative for tank car safety improvements most always rests with the AAR;

Recognition that there is no contribution to the AAR's deliberations on behalf of the Canadian public;

Identification that resolution of safety problems recognized in Canada seem to be left to the AAR Tank Car Committee;

Documentation that the AAR is a self-regulating agency operating in a geographical territory over which no single regulatory body had complete jurisdiction, that the AAR performs both coordinating and technical functions for assistance both to its members and any other group that requires the AAR expertise, and that [the AAR] is able to draw upon a substantial body of technical knowledge and expertise;

Recognition that an AAR standard, on the average, may be acceptable to the Tank Car Committee members and to their respective 'constituencies' but these individuals may or may not always include Canadian interests and concerns;

Identification that a means must be developed for reviewing and evaluating AAR standards on behalf of the Canadian public;

Recognition that by substituting a new formal structure for the present ad hoc Canadian surveillance and regulation of design specification standards that originate with the AAR will better serve to protect the safety of the Canadian public.

Case History: FRA Oversight of AAR Tank Car Safety Activities

Early nonpressure stub-sill tank cars manufactured by GATX tended to buckle in the shell of the tank as a result of buff forces, the longitudinal forces generated during train operations. These tank cars were experiencing localized buckling near the inboard ends of the draft sills. If damages occurred during normal operations and the tank car was designed and constructed according to AAR standards, the railroads were required to pay for the damages incurred.

In response to an AAR-member railroad report of incidences of tank car buckling, the AAR reviewed these incidents and its design standards. The AAR Car Construction Standards Committee determined that its 800,000-pound compressive end-load criteria 35/ for railroads should be increased and on July 1, 1974, established a 1,000,000-pound compressive end-load standard. While the rail industry through the AAR did not require tank cars to be modified to the new AAR draft loading standards, at that time it was made effective for new and rebuilt status cars and for those car owners who wanted protection under the interchange rules for buckling damages. Under interchange rules, railroad liability was limited to those cars that were retrofitted to meet the new 1,000,000-pound draft standard.

35/ Draft, buff, compressive, and impact loads were all increased at this time.

To comply with this new standard, GATX qualified a design that modified existing noncomplying tank cars by longitudinarily attaching to the underside of the tank two parallel steel bars located 16 inches apart. (All owners of these tank cars did not elect to retrofit their tank cars. However, in response to the occurrence of several spectacular buckling incidents involving empty tank cars, in 1985 the AAR issued a requirement that tank cars not presently complying with the new loading standard must be retrofitted to meet this standard by 1989.)

To meet the 1974 end-load requirements for newly manufactured tank cars, GATX modified its design by incorporating the reinforcement bar retrofit design such that it could withstand the new end-load requirements. Under this revised design, RAIX 7033 was manufactured by GATX in January 1976 as a DOT Specification 111A100W4 tank car specifically for the transportation of ethylene oxide. This design also included the attachment of a jacket anti-shift bracket welded directly to the tank shell. The anti-shift attachment used by GATX violated a November 6, 1971, Federal and 1969 AAR requirement specifying that reinforcing pads must be used between external brackets and shells if the attachment weld exceeds 6 linear inches of 1/4-inch weld fitted, that reinforcing pads must not be less than 1/4-inch, and that the ultimate shear strength of the bracket-to-reinforcing pad weld must not exceed 85 percent of the ultimate shear strength of the reinforcing pad-to-tank weld. (GATX reported that from 1971 through 1981, more than 9,810 tank cars were equipped with anti-shift bars welded directly to the bottom of the tank shell under AAR-approved certificates for construction.) GATX noted that during this period the company's construction drawings were not updated to reflect the November 6, 1971, change in the DOT tank car safety standards.

Because of Federal requirements under HM-175 for retrofitting certain tank cars with insulation and puncture protection for the ends of tanks, modification of this tank car was required. North American Car Company (NATX), an AAR-approved tank car fabricator, submitted an application to the AAR on September 29, 1981, to make the Federally-mandated modification for adding head protection and insulation. On December 14, 1981, the AAR Tank Car Committee approved NATX's requested modification as meeting both AAR and DOT requirements.

Modification of RAIX 7033 in accordance with the AAR-approved drawing was completed on December 3, 1981. This AAR-approved tank car repair facility did not recognize that the anti-shift bracket installation did not comply with the existing Federal standards for protecting attachments. A representative of the repair shop stated that its responsibility is to ensure that a car meets all AAR requirements and regulations, but it does not question the design of the car. If there is a problem, the repair facility will notify the car owner and obtain approval to fix it.

Records concerning the history of this tank car show that on April 25, 1983, stiffener bars were welded to the steel jacket of RAIX 7033 on each side of the anti-shift bracket. While it was not possible to determine precisely why this work was performed, the modification strengthened the steel jacket in the area of the anti-shift bracket. Apparently, stabilizing the movement of the jacket in relation to the tank had been difficult, and this action had damaged the jacket in the area of the anti-shift bracket. (The idea that the anti-shift bracket was not adequate to stabilize the jacket was supported on January 17, 1985, by the Safety Board's documentation of damage to the jacket in the area of tank bolster plate.)

On December 31, 1984, ethylene oxide was discovered to be leaking from RAIX 7033 while it was located in a railroad yard at North Little Rock, Arkansas. The Safety Board's investigation of this incident concluded that the ethylene oxide had leaked from

RAIX 7033 as a result of two through-shell cracks near the center of the bottom of the tank at each extremity of the welds on the anti-shift bracket, that the cracks resulted from the forces transmitted to the tank through the anti-shift bracket when the jacket moved relative to the tank during normal operations, that the welded connection of the anti-shift bracket was installed in violation of Federal standards, and that neither the AAR nor the FRA monitor manufacturers of tank cars for compliance with DOT tank car design, standards, and proper construction methods.

During the Safety Board's investigation of the North Little Rock, Arkansas, accident, it learned that on April 1, 1985, GATX submitted to the Tank Car Committee for approval an application to modify four tank cars similar to the design as RAIX 7033, but not including RAIX 7033, in order to remove that portion of the existing anti-shift bracket in excess of 2 inches below the tank and then attach a new anti-shift jacket bracket either to the existing tank stiffener bars on the bottom of the tank or, for those tanks not equipped with tank stiffener bars, to airbrake cylinder supports attached to the tank by the use of a reinforcing pad. Through this application, GATX sought to obtain a "precedent" for modifying similar noncomplying tank cars. In securing a "precedent" approval, GATX would then have been allowed to modify all other similarily noncomplying tank cars by filling an Exhibit R-1 with the AAR and:

- o without further review and approval by the Tank Car Committee since it was a previously approved procedure;
- o without complete removal of the noncomplying anti-shift anchor in accord with the procedure;
- o without having to notify the FRA of the modifications to the tank cars; and
- o by using repair methods approved in AAR's 1985 appendix R which had not yet been approved by the FRA. (This would have allowed GATX to x ray and postweld heat treat only those weld repairs 3/16 inch in depth or 6 inches in length.)

The AAR Tank Car Committee declined to approve the GATX application as submitted and requested GATX amend its application by including x ray and stress relief for welded repairs of tank cars transporting products under pressure. On April 9, 1985, GATX submitted the requested changes and on April 12, 1985, by telephonic balloting of Tank Car Committee Members, the application was approved. However, on April 15, 1985, the chairman of the Tank Car Committee in casting a negative note requested additional clarification of the GATX application; his position was that if either the 3/16-inch depth or the 6-inch length of crack were exceeded, then postweld heat treatment and x ray would be required on all weld repairs. On April 19, 1985, GATX again revised its application incorporating the changes requested by the chairman of the Tank Car Committee. On April 22, 1985, the GATX application was again approved by the committee as being, in their opinion, in compliance with AAR and Federal requirements. On May 6, 1985, GATX voluntarily submitted a self-generated revision to its application to modify the size of the hole required in the tank car jacket for performing the modifications previously approved by the AAR.

On May 17, 1985, the Safety Board made two recommendations to the FRA because of additional information gained during its continuing investigation of the December 31, 1984, incident related to RAIX 7033, the large number of tank cars

equipped with anti-shift brackets similar to RAIX 7033, and the fact that FRA had taken no action concerning the modifications being proposed by GATX. These two recommendation were:

R-85-59

Require inspection of all jacketed cars in hazardous materials service that have anti-shift brackets protruding outside the tank jackets for indications of jacket shifting or product seepage in the anti-shift bracket area, and remove from service all cars that exhibit symptoms of such distress until approved repairs are made.

R-85-60

Evaluate for adequacy and timeliness, directing changes as necessary, the General American Transportation Corporation's proposed inspection and repair program for bringing tank cars on which anti-shift bracket are welded directly to the tank shell into regulatory compliance, and monitor the completion of the program.

In response to these recommendations, on June 12, 1985, the DOT issued a notice requiring that the DOT specification stenciling be removed from all GATX tank cars that have the anti-shift anchor welded directly to the tank shell. It also directed that the cars be removed from hazardous materials service and not be returned to hazardous materials service until action had been taken to bring the cars into compliance with Federal regulations. Concurrent with its notice, the DOT formally advised each car owner and lessee that they had 10 days to return affected tank cars to their destination in empty condition for making repairs. Also, the DOT requested to be advised about the retrofit schedule and field repairs.

In response to the DOT notice, car owners and lessees began advising the DOT that to comply with its order they would experience extreme hardships because a large percentage of tank cars in their fleets would be affected by the order. The DOT received requests for exemption to the order as early as June 17, 1985. Included with some of the petitions for exemption were GATX's April 9, 1985, application for repairs that had been approved by the AAR.

In response to the requests for exemption, between June 19, 1985, and July 8, 1985, RSPA granted exemptions affecting more than 800 tank cars. This allowed tank cars other than those used for transporting flammable gases to continue transporting hazardous materials through September 15, 1985, provided they were marked with the exemption number and that they were inspected to determine that there was no evidence of leakage in the area of the anti-shift anchor or shifting of the jacket. In granting an exemption to the Union Oil Company, RSPA noted that three LPG tank cars were included that already had been modified in accordance with the April 9, 1985, GATX modification approved by the AAR. The FRA, in its July 1, 1985, memorandum to RSPA, recommended including the three LPG cars under the exemption even though the FRA recognized that the modification did not comply with DOT requirements. The FRA noted that the noncompliance was because the anti-shift anchor had not been fully removed. The FRA favored including these cars in the exemption because it believed the modifications had reduced substantially the likelihood of tank failure as a result of the tank being torn by the anchor.

Late in June and early in July 1985, the FRA began receiving information it had requested from tank car owners and lessees concerning the retrofit schedule field repairs. At this time, FRA determined that 400 tank cars were being retrofitted by just cutting off a portion of the noncomplying anchor and leaving a stub on the tank. The FRA informed the AAR and GATX that these 400 tank cars would have to be removed from service and tested for cracks in the area of the anti-shift anchor stub. It further informed them that the April 9, 1985, AAR-approved modification did not comply with DOT's interpretation of its requirements and that it did not recognize as acceptable the use of defect-size criteria other than that incorporated in appendix R of the 1982 Edition of AAR's Manual on Tank Cars for Specification.

On July 31, 1985, in response to the FRA concerns, GATX submitted to the AAR Tank Car Committee a fourth revision to its application for modifying the tank cars. This revision included a proposal to use a surface grinding method for repairing partial-depth cracks by grinding up to 1/16-inch below the existing shell thickness without restoring the removed metal.

On August 5, 1985, the Tank Car Committee met separately with the FRA and GATX to discuss this modification of tanks with the noncomplying anti-shift brackets. At his meeting, GATX advised the Tank Car Committee that it already had used the surface grinding method on 4,350 tank cars and that its removal of 1/16-inch shell thickness below that required by specifications without restoration had not comprised the safety of the tank cars. At this time, the Tank Car Committee advised GATX to resubmit its latest proposal, which included the repair by surface grinding, but to amend it by providing documentation and justification for use of this method.

During its meeting with the FRA, the Tank Car Committee discussed a number of issues, including GATX grinding-only repair method, the AAR tank car repair specification pertaining to actions to be taken after removal of fractures, minimum tank car shell thickness, concerns that other tank cars approved by the AAR also may not comply with DOT regulations, the sampling of Tank Car Committee documents, implementation by the AAR of routine tank car builder site inspections, and improving communications between the AAR and the FRA.

On August 6, 1985, GATX revised its latest proposal as directed by the Tank Car Committee and resubmitted it to the AAR for approval. On August 23, 1985, the Tank Car Committee did not approve the GATX application. Rather, the chairman of the Tank Car Committee requested clarification of certain aspects of the proposal which GATX provided.

In an August 12, 1985, letter to the FRA's Associate Administrator for Safety, the AAR said of the AAR/FRA special meeting, "In principle there was no reason to disapprove the grinding-only method of repair for cracks 1/16 inch or less in depth and 6 inches or less in length." In addition, the AAR stated, ". . . [the] minimum tank car shell thicknesses specified in Part 179 of 49 C.F.R. apply only to new tank cars," and that the "combination of the specification for new cars and that for repair relies on the stipulation of sufficient margins of surplus thickness in the new car specification to allow for normal repair and deterioration over the life of tank cars." The AAR letter further stated, "This method, concentrating on conservative standards for new tank cars to ensure safety over the entire life cycle has proven to be extremely successful in practice--as witnessed by the highly satisfactory performance record," and ". . . despite the GATX incident, the Committee is performing its function ably and with great success in ensuring that rail remains the safest mode for transport of hazardous materials. No

overall shortcomings in procedures or expertise are evident." Concerning improved relations with the FRA, the AAR letter stated, "The Committee fully endorsed an expanded scope of two way communications between the AAR Tank Car Committee and the DOT representatives" and ". . . [it] hopes that the communicative relationship can be formulated to become increasingly less 'reactive' and more constructively 'anticipative.' " The AAR suggested the following for FRA's consideration:

> At the planning level set an AAR/DOT rail hazardous material transportation overview group to periodically look "down stream" to anticipate future regulation problems and/or safety improvement needs. (The idea is to structure the communications system to stay ahead of continuous "band-aid" type responses.)
>
> At the day-to-day working level, establish a procedure whereby DOT would be provided with an excerpt summary of the agenda of regular AAR Tank Car Committee meetings and upon notification from DOT of interest, schedule a liaison briefing of respective representatives.
>
> With the assurance of strict confidentiality for proprietary information, add DOT personnel to the mailing list of letter ballots including approvals of applications of tank car builders so that DOT objections and/or comments could be registered as part of regular approval process.
>
> Schedule AAR/FRA staff briefings and technical exchanges to explore current concerns and/or recommendations of the concerned parties.

On August 12, 1985, the FRA advised the Safety Board that it was monitoring the retrofit programs at approximately 50 AAR-certified shops to ensure that repairs being performed were in compliance with the DOT and AAR requirements. In its September 4, 1985, report on the December 31, 1984, incident at North Little Rock, Arkansas, the Safety Board stated:

> While its prompt action to remove these tank cars from service is commendable, the FRA has yet to address the adequacy of the method of repair for these tank cars as proposed by GATX and approved by the AAR, and it is not monitoring the adequacy of field repairs made of these tank cars. The State of Louisiana furnished information to the Safety Board based on its inspection of field modifications being made to replace noncomplying anti-shift anchor attachments. The inspections indicate that the procedure being used for retrofitting these tank cars may destroy the integrity of the tank shell. For example, heat and/or mechanical damage may occur to the tank shell during removal of the existing anchor with a cutting torch or hammer. Also, the tank shell thickness may be reduced to less than that required by the DOT tank car specification as a result of grinding out surface cracks. Because more than 280 tank cars per week are being inspected, retrofitted, and returned to service using the AAR-approved method, the Safety Board urges the FRA to institute, without further delay, the action earlier called for in Safety Recommendation R-85-60.

On August 30, 1985, the Tank Car Committee approved GATX's application including the use of surface grinding to remove the partial-depth cracks; however, it conditioned the approval by stating that it could not be used as a "precedent" in support of

future applications. In approving this latest application, the Tank Car Committee stated "that the repaired area was neither in or adjacent to any high stress area, residual stresses due to welding were avoided, and the stress concentration due to blended grinding was low." In response to the AAR action, GATX pointed out that because the AAR approval was not for precedent use, GATX now had authority to modify only the four cars listed in the application, and it was precluded from the use of this application in making modifications to other cars with similar deficiencies.

At its annual meeting on October 17, 1985, the Tank Car Committee discussed the problem raised by GATX and it was agreed to remove the "precedent" restriction for the application to allow all tanks with similar deficiencies to be repaired under this application; however, it stated that any future use of the surface grinding method would not be allowed unless approved by the Tank Car Committee on separate applications.

A DOT task force reviewed, in part as a result of deficiencies identified with RAIX 7033, the FRA programs related to the safety of tank cars. In its October 1985 "Report of the Safety Review Task Force on Federal Railroad Administration Safety Programs," DOT noted that the task force met with the FRA to discuss various alternatives for achieving greater FRA involvement in the design and construction of new tank cars and for developing comprehensive inspection procedures for existing tank cars. The report noted that neither the FRA nor the AAR had a provision for monitoring construction of new tank cars to ensure that they conform to the approved design and that as a result, FRA will or has, initiated closer liaison with the AAR Tank Car Committee; procedures assuring improved oversight and inspection of rail tank car construction; and procedures for spot checking existing rail cars. The task force recommended:

> That FRA, in cooperation with RSPA, establish a closer liaison with the AAR Tank Car Committee during the rail tank car approval and design process; develop procedures to assure improved oversight of rail tank car construction and study the feasibility of adopting construction inspection requirements called for in DOT's issued NPRM HM-183 and HM-183A, Requirements for Cargo Tanks Used for Highway Transportation of Hazardous Materials, and establish procedures for spot checking existing rail tank cars to assure to proper construction.

On November 22, 1985, the AAR petitioned the DOT to adopt appendix R as contained in the 1985 Edition of AAR's Specifications for Tank Cars M1002. On June 3, 1986, the DOT published a rulemaking notice (HM-166U) stating its intention to adopt AAR's 1985 appendix R. With minor changes (not related to M1002), this rulemaking was published as a final rule on April 19, 1987.

An August 27, 1986, letter from the FRA chief counsel to the AAR noted that recent tank car issues, notably GATX anti-shift anchor matter, have risen involving the role of the Tank Car Committee, the application of the AAR specifications for tank cars, and the DOT hazardous materials regulations. Specifically, the letter stated,

> The FRA could not accede to the AAR's conclusion stated in your [AAR's] letter of August 12, 1985, . . . that the minimum shell thicknesses as specified in Part 179 apply only to new tank cars, . . . [that] any deviation from the specifications lacking such approval by DOT violates the hazardous materials regulations, . . . [that] one cannot seriously suggest that a safety feature required in Part 179 could be modified or eliminated with

> impunity once a certificate of construction has been executed. Neither safety nor logic would countenance such a view. The hazardous materials regulations do not.

Because of the implications about minimum shell thickness raised by the surface grinding method proposed by GATX and because of differences between the AAR and the FRA over interpretations of the DOT regulations concerning minimum shell thicknesses, both the AAR and the DOT implemented research programs to determine the effects of the grinding of fractures and to investigate the effect of reducing the minimum tank thicknesses on the effective service life of a tank car. Additionally, the FRA has stated that it will issue rulemaking proposals in late 1987 concerning minimum shell thickness and concerning nondestructive testing. During the April 9, 1987, meeting with the Safety Board, the AAR representative stated:

> . . . that the DOT regulations specify minimum shell thicknesses. The DOT specifies a 7/16-inch shell thickness as the minimum allowable for RAIX 7033. Until recently, there has been no indications that shell thickness was a regulatory or enforcement issue. The AAR Tank Car Committee had not previously considered the surface grinding technique as an option for repairing tank cars. The after-the-fact interpretation questions currently on the table between the AAR and the FRA are in the process of being resolved. As always, Tank Car Committee procedures will be altered to agree with the latest decisions.

Also at the April 9, 1987, meeting, the FRA representative stated that the shell thicknesses prescribed by the DOT regulations was the minimum allowable and that the DOT regulations do not provide for reducing the stated thicknesses.

ANALYSIS

Emergency Response

Initial Response Actions.--Immediately following a railroad accident, the conductor is responsible for providing emergency response personnel information about the train and its contents. When a derailment occurs involving crewmembers in the locomotive and a caboose, a crewmember from both the front and rear of the train inspect the train concurrently by walking toward the derailment to identify the last standing cars at each end of the derailment. This information and the train papers help to identify the cars involved in the derailment and save valuable time in identifying the location of the hazardous materials tank cars.

In the accident at Miamisburg, Ohio, all the train crewmembers were located in the locomotive because the train used a rear-end marker rather than a caboose. Consequently, the crewmembers were isolated from the rear of the train by the river and the derailed cars on the bridge. The conductor initially searched the forward portion of the train for the two "Dangerous" tank cars, but he took no action to dispatch one of the other crewmembers to the rear of the train to determine which cars remained upright and on the rails. As a result, the conductor was able to give emergency response personnel only limited information on the number of cars derailed and the materials involved in the derailment. The firechief, therefore, had to send firefighters into the derailment site in full protective equipment to obtain the needed additional information. With this information and the assistance of the trainmaster, the conductor identified the phosphorus, sulfur, and tallow tank cars that were derailed on the bridge.

Additional delays were experienced in providing emergency response personnel information about hazardous materials transported by the train because of other ineffective actions by the conductor. When the firechief requested all information carried on the train, the conductor lost valuable time retrieving waybills and reassembling the waybills in proper order to identify all the cars in the derailment. Additionally, the conductor inadvertently left an emergency guide for handling phosphorus on the floor of the locomotive when he searched for the "Dangerous" tank car information. This emergency guide prominently displayed the shipper's 24-hour emergency telephone number, information on product hazards, and technical advice of handling emergencies involving phosphorus that could have aided emergency responders.

In a review of recent rear-end train collisions, the Safety Board noted that in the event of either a front-end or rear-end collision of a cabooseless train, the consist list of materials carried on trains could be destroyed and the local emergency response personnel would be without a critical immediate reference. The Safety Board observed that a conspicuous consist list container at, on, or near the end-of-train device on a cabooseless train would help to correct this deficiency. Such a container could be no more than a large plastic yellow envelope secured to the end-of-train device with wire ties and lettered "CONSIST LIST" or "HAZARDOUS MATERIALS LIST." As a result of this review, on June 25, 1987, the Safety Board recommended to RSPA:

R-87-18

Require that on cabooseless trains involving hazardous materials a conspicuous weatherproof container be affixed at, on, or near the rear-end marker to hold a current consist list for use by emergency response forces.

On July 31, 1987, RSPA responded that it does not plan to require such a container for hazardous materials consist lists and that in their view the possibility exists that cars may be added or removed from a train and that, consequently, the consist may not reflect accurately the location of hazardous materials cars within a train. In its September 10, 1987, letter to RSPA, the Safety Board responded that it considers that the benefits of having information about the hazardous materials in both ends of the train far outweigh any shortcomings. Further, the Safety Board added that RSPA has ignored certain factors and scenarios that should be taken into consideration that support implementation of this recommendation. The Safety Board urged RSPA to reconsider its position in regard to having a consist list at both ends of the train.

As demonstrated in the train crewmembers' response to the Miamisburg accident, cabooseless trains can create problems for crewmembers in identifying the derailed cars because crewmembers are no longer located at both ends of the train. The railroad industry and the FRA must compensate for this operational change by developing procedures for cabooseless train operations so that emergency response personnel can be provided early reliable information about the train consist. Improved methods or procedures must be developed to assist crewmembers in gathering essential information and to prevent delays in identifying the cars and materials in the derailment. In addition, information on the contents of the train should be kept at both ends of the train to avoid the destruction of all train documents in a derailment or collision. The Safety Board encourages the railroad industry and FRA to examine the operating practices for cabooseless trains carrying hazardous materials and to develop procedures and practices capable of providing reliable, timely information to emergency response personnel about the presence of hazardous materials in derailments.

The lack of information regarding the location of the sulfur tank car and the conflicting technical advice provided on the use of water in handling the emergency made the job of the firechief more difficult. Although the conductor stated that there were three tank cars in the derailment, this information was not properly verified. Later the fire chief was advised that only two tank cars were involved in the derailment, and emergency response actions were disrupted to allow a proper accounting of cars and materials involved in the emergency. This lack of verified information coupled with the previous inappropriate trainmaster's communications challenging the firechief's authority initially lessened the overall effectiveness of the railroad personnel in working to support the local emergency response agencies. While these actions ultimately did not have a significant adverse effect on public safety, railroad personnel must work with emergency response agencies during emergencies that threaten the public and effectively use their experience and training to provide accurate, timely information needed by local response agencies in developing response actions to protect the public.

The initial order of the firechief that the city should begin an evacuation was based on his observation of the direction and size of the smoke plume coming from the fire area and his concern about the possibility of toxic pollutants. The presence of toxic pollutants was later verified by air monitoring data and the large number of medical complaints during the incident. Furthermore, his initial decision to use a direct hose stream attack to flood the fire area was based on his review of available technical resource documentation and advice from available on-scene technical expertise. These initial actions provided time to assess the situation and safely complete the evacuation, to establish emergency resource support capabilities, and to coordinate necessary assistance and technical support.

Longer-Term Actions.--The response actions, which were selected during the next several days by the city from the many recommended actions by various participating agencies and organizations, may have prolonged the duration of the emergency and resulted in a larger evacuation area. However, the selected response actions were predicated on the limitations of available firefighting equipment, on concerns for the firefighters safety, on the weather conditions, and on achieving maximum public safety as opposed to concerns about the operational inconvenience of the railroad and others. Miamisburg officials recognized that because of weather conditions and equipment limitations, many of the ideal options for handling the emergency were not possible. While early actions to accelerate the rate at which the phosphorus was being burned and applying water spary to the plume of smoke could have significantly reduced the area threatened by the toxic effluents, this option was not possible early in the emergency or until the fire was under control.

The Miamisburg officials took early command of the emergency and implemented effective management procedures for obtaining and using all available technical assistance. The overall coordination among the many responding agencies was effectively managed during this 5-day emergency. Communications among the many area response agencies were well managed, and the high level of preparedness was reflected by the actions taken during this emergency. The high level of preparedness greatly assisted local response agencies in effectively recognizing and dealing with inconsistent information that was provided following the derailment.

The problems which resulted because sulfur was involved raised additional concerns for Miamisburg officials primarily because of sulfur mixing with phosphorus. Molten sulfur is presently not regulated as a hazardous material for rail transportation. The Safety Board believes it should be fully regulated for the following reasons: (1) it can

pose thermal hazards due to its molten state when transported in tank cars; (2) it can produce toxic pollutants when burned; (3) it can react with other materials and thereby increase the hazards posed during emergencies; (4) it can intensify fires occurring during derailments by increasing the total amount of materials subject to burning; and (5) it is not required to be identified as a hazardous material in the waybills, and information about its presence may not be provided by railroad personnel to emergency response agencies following a derailment.

The DOT needs to evaluate the events at the Miamisburg accident regarding the involvement of molten sulfur. This nonregulated material increased the size of the spill area, heightened concerns for public safety because of its potential for reacting with the phosphorus, and increased the amount and the types of toxic pollutants emitted. The DOT is urged to expedite the issuance of a final rule on Docket No. HM-198 regulating molten sulfur as a hazardous material to insure adequate safeguards in transportation.

Emergency Response Guides

In its February 26, 1981, special investigation report, 36/ the Safety Board concluded that the guidance and technical advice provided during an April 3, 1980, hazardous materials emergency response at Somerville, Massachusetts, impeded the efforts of local officials to control the spill and increased the adverse effects of the spill on the community.

The Safety Board further found that the local officials were forced to use a "trial-and-error" procedure during the emergency because available emergency response guides and on-scene technical advice were inadequate, inconsistent, and confusing. These findings resulted in the Safety Board issuing a recommendation to the DOT:

> I-81-1
>
> Investigate the adequacy and consistency of hazardous materials emergency guides and other advice available to local officials for use in controlling hazardous materials releases furing transportation, and take necessary steps to assure that they provide sufficient and consistent guidance and advice to help local officials control hazardous materials spills quickly and effectively.

In its December 4, 1981, response, the DOT advised it had formed an ad hoc group composed of representatives from governments, industry, and private consultants to review the adequacy of the information contained in the DOT Emergency Response Guidebook and to review the guidance provided in emergency response guidebooks available from the B of E and the NFPA. The DOT believed that these actions would lead to guidebook consistency and accuracy. In 1984, the DOT issued a new edition of its Emergency Response Guidebook.

On April 26, 1982, the Safety Board advised the DOT that it had classified Safety Recommendation I-81-1 as "Open-Acceptable Action" and requested that the DOT provide quarterly reports on the progress being made by the DOT review group. The Safety Board's letter also noted that the DOT response had not addressed Safety Recommendation I-81-2 that called for improvements in the DOT guidance provided on

36/ For more detailed information, read Special Investigation Report--"Phosphorus Trichloride Release in Boston and Maine Yard 8 During Switching Operations, Somerville, Massachusetts, April 3, 1980," (NTSB-HZM-81-1).

the use of water in handling phosphorus trichloride. Although the DOT had not specifically addressed this safety recommendation, the Safety Board advised that it would hold this safety recommendation in an "Open--Acceptable Action" status until the DOT issued its 1984 edition of the DOT Guide.

On July 6, 1982, the DOT advised the Safety Board the DOT review group did not have a fixed schedule for meeting, but it can be convened at the urging of State and local government, the industry, or the Safety Board. The DOT stated that the Safety Board would be informed of each meeting as it is called and has a standing invitation to attend. The DOT believed that this approach would be more productive than the issuance of quarterly reports. The Safety Board was advised that the revision of the 1980 Guide was being conducted by Johns Hopkins Applied Physics Laboratory and that the B of E and the NFPA guides specifically were being reviewed. The DOT believed that this action would lead to guidebook consistency and accuracy. Concerning Safety Recommendation I-81-2, the DOT advised that the review group was considering changes to the guidance provided for handling phosphorus trichloride and that the 1984 Guide would clarify the current language. On August 11, 1982, the Safety Board advised the DOT that Safety Recommendations I-81-1 and I-81-2 would be classified as "Open--Acceptable Action." In 1984 the DOT issued its revised guidebook. Based on the Safety Board's review of the guidance provided for phosphorus trichloride, it classified Safety Recommendation I-81-2 as "Closed--Aceptable Action."

After its review of the response information provided in guides used or available for the Miamisburg emergency, the Safety Board remains concerned about the adequacy and consistency of information provided in emergency response guides published by the DOT and others. Despite the useful amount of information included in the available emergency response guides, the specific conditions for the recommended actions were not clearly stated in each case. For example, the term "flooding amounts of water" used in the guides did not have consistent meaning for either railroad personnel or the firefighters resulting in confusion as to the appropriate action to be taken. The railroad emergency specialist, who had had a similar experience, recognized that the objective for using flooding quantities of water was to cover the phosphorus surface to prevent contact with the air and that the flooding should be accomplished in the tank car. Other personnel interpreted the objective as flooding the area of the fire with as much water as possible. Another inconsistency noted among the available guides was that some guides provided information on the possibility of an explosion if the phosphorus combined with the sulphur, while other guides provided no such warnings. Also, none of the guides noted that the combination of phosphorus and sulphur could result in the emission of more highly toxic effluents than would either material by itself.

Emergency response guides should state objectives for recommended actions, clearly define terms that may cause confusion to the various users, and provide essential information concerning potential adverse chemical interactions. The Safety Board does not believe that the DOT has accomplished the improvements sought by Safety Recommendation I-81-1 and that it should intensify efforts for coordinating with other developers of emergency response guides. Thus, the Safety Board has classified Safety Recommendation I-81-1 as "Open--Unacceptable Action."

Tank Car Performance

The Safety Board has issued many recommendations to the FRA and others for improving the crashworthiness of tank cars. (See appendix C.) Since 1979, the Safety Board has directed much of its effort for improving tank car crashworthiness to bring about new designs to prevent the release of hazardous materials from tank cars.

Tank Car Coupler and Thermal Insulation Performance.--The phosphorus, sulfur, and tallow tank cars sustained severe mechanical damage during the derailment. The top- and bottom-shelf couplers on the phosphorus tank car absorbed the initial buff forces during the derailment. However, the leading head on the sulfur tank car received at least two slits when it detrucked and struck derailing equipment. Even though coupler separation occurred between the sulfur and its trailing car, the outer jacket and insulation absorbed much of the impact forces. Following the derailment, the sulfur tank car was also subjected to intense heat from the adjacent burning phosphorus tank car as evidenced by the extent of fire damage to the steel jacket and thermal insulation on the south end of the sulfur tank car. During this time, the insulation reduced immediate overheating and allowed the firefighters additional time to cool the tank car.

The lead end of the tallow tank car struck the trailing end of the sulfur tank car following coupler disengagement during the initial run-in. Both of these ends received punctures directly above the sills which caused an immediate release of the products. The sulfur car was equipped with F couplers and the tallow car was equipped with E top- and bottom-shelf couplers. The couplers of these cars were not restrained during the derailment and were not totally effective in preventing car misalignment. Had both cars been equipped with shelf couplers, most likely the head damages would have been minimized and the total quantity of sulfur and tallow released would have been greatly reduced.

During the Safety Board's investigation of the Pine Bluff, Arkansas, accident 37/ on June 9, 1985, it discovered that the general use of shelf couplers on all types of rail cars would prevent derailment damages caused by failed coupler connections and would probably reduce the adverse effects of all train derailments. In response to Safety Board Safety Recommendation R-86-43, the AAR initiated interchange rule changes to promote use of the bottom-shelf coupler design on all types of rail cars. In its June 16, 1987, letter to the AAR, the Safety Board responded that it considers these rule revisions which facilitate the substitution of bottom-shelf couplers for E-type couplers an acceptable alternative to the requirement outlined in the recommendation.

Tank Car Attachment Performance.--The phosphorus tank car, which was equipped with airbrake attachments welded directly to the tank, detrucked on the bridge. This allowed the tank car's airbrake equipment, which was closer to the ground than any other tank car tank appurtenance, to impact with debris and the ground. These impact forces then were transferred through the airbrake support directly to the tank shell which tore the tank car open and thereby release large amounts of phosphorus. The other two tank cars that derailed had the airbrake equipment attached to the draft sill rather than directly to the tank. These detrucked without either of them experiencing bottom tears in the tank shells.

The major breach of the phosphorus tank car through which 75 percent of the liquid phosphorus was released immediately after the derailment could have been avoided had airbrake attachments been connected to the draft sills or attached to the tank car by a properly designed bottom reinforcing pad. In addition, had the airbrake support been designed to break away before allowing the transfer of forces that tore the tank shell, this bottom breach in the tank likely would not have occurred.

37/ For more detailed information, read Railroad Accident Report-- "Derailment of St. Louis Southwestern Railway Company (Cotton Belt) Freight Train Extra 4835 North and Release of Hazardous Materials Near Pine Bluff, Arkansas, June 9, 1985," (NTSB/RAR-86/04).

The AAR previously recognized the hazards posed to tank cars during derailments by bottom fittings and attachments. The Safety Board is pleased that the AAR now has required that all tank cars in hazardous materials service equipped with brake support attachments welded directly to tank shells be retrofitted by 1992. During this 5-year period, tank cars transporting the higher hazard commodities are being retrofitted first. However, in the AAR's decision in 1977 not to include protection for bottom attachments in its bottom outlet protection program, the AAR missed an early opportunity to address this safety problem as it was aware that such attachments could rupture tanks during derailments just as bottom outlets. Had the AAR reviewed the circumstances of the previous recorded failures, perhaps it would not have discounted the need to protect these attachments. Additionally, the FRA had no part in this decision not to include protection for bottom attachments since it was not determining the adequacy of actions taken by the AAR or determining their affect on public safety.

When the need for reinforcing pads was first recognized by the AAR in 1971, no design engineering evaluation was made to determine the adequacy of this proposed modification to tank cars. The initially required 1/4 inch pad thickness was determined to be inadequate only after fatigue failure separations began occurring during normal operating conditions. Even after the AAR learned that its requirements for pad designs were deficient, it did not inform the FRA that the the Federal standard was deficient. Rather, it depended on tank car manufacturers to voluntarily install thicker pads.

Other investigations by the Safety Board and by the CTC have raised concerns about the effect on tank car crashworthiness due to attachment designs, materials, and quality control used in making welded attachments to tank cars. On April 4, 1985, a leaking anhydrous ammonia tank car was discovered at the Burlington Northern Railroad Balmer Yard in Seattle, Washington. Inspection of the tank head by the Safety Board determined that a brittle fracture had developed in an area adjacent to the reinforcing pad. Metallurgical tests determined that the fracture resulted from the quality of the fillet weld at the stub-sill to reinforcing pad connection and the low temperature brittle properties of the steel used for the pad and tank head. Following this incident, the tank car manufacturer identified reinforcing pad cracks in at least 28 similarly manufactured tank cars and replaced the reinforcing pads with a fine-grain steel which had improved low temperature brittle properties. Additionally, the car company equipped several hundreds of its cars with 9- by 13-inch removable plates on the jackets to facilitate periodic inspections of the welds on the reinforcing pads during the service life of the tank cars. All remedial action has been left to the tank car manufacturer with the FRA and AAR collecting data on the operating experience to determine if additional action is necessary.

On January 4, 1986, a sulfuric acid tank car was discovered leaking in the Canadian National Yard in Cambellton, New Brunswick, Canada. The tank shell, made from steel displaying low temperature brittle properties, developed a brittle fracture in an area adjacent to the reinforcing pad resulting in the leak. Of concern was the quality of the fillet weld at the stub-sill to reinforing pad connection and the low temperature brittle properties of the steel from which the pad and tank head were made. The investigation conducted by CTC concluded that ASTM 515 steel, as presently permitted in its and the FRA regulations, is not an adequate material for the manufacture of tank cars. Further, the CTC revised its "Regulation for the Transportations of Dangerous Commodities by Rail" to require the use of ASTM 516 steel for newly built tank cars used or manufactured in Canada.

The Safety Board is concerned about the longer term implications of these findings to other tank car manufacturers who may be using similar procedures and materials. Consequently, the FRA and the AAR are urged to implement an overall assessment of the problems being experienced with attachments to tank cars and to determine the adequacy of the design, quality control standards, and practices to identify improvements necessary in existing design and manufacturing standards and to develop and implement necessary modifications for existing tank cars.

Tank Car Safety Programs

After this review of the FRA, AAR, and the CTC processes for developing tank car safety standards and for identifying deficient conditions and acting to remedy those conditions, it is clear to the Safety Board that voluntary industry actions, rather than FRA actions, have had the most effect on the safety standards of tank cars. This is a result of delegating this responsibility to the AAR. In so doing, the FRA and the CTC have failed to established any substantive control over the AAR's implementation of the delegated authorities, have not established substantive reporting requirements concerning actions taken by the AAR, and have not established or implemented a comprehensive program for periodically monitoring the actions taken on behalf of the respective governments.

Before the FRA was responsible for public safety with respect to transporting hazardous materials by tank car, the AAR had established procedures for developing design standards and for controlling the safety of tank cars. When the responsibility for tank car safety was delegated by the Secretary of Transportation to the FRA or during the 20 years after, the FRA did not objectively act to assess the adequacy of the AAR's implementations of a major safety regulatory program. Had it done so, the FRA would have learned that the AAR had knowledge of many tank car deficiencies and had not informed the FRA. The FRA would also have discovered that the Tank Car Committee provided a great opportunity for members representing chemical manufacturers and tank car owners to control many key decisions affecting transportation safety and provided little or no opportunity to specifically identify or consider public safety concerns.

The Safety Board notes that voluntary industry efforts taken through the Tank Car Committee generally have been good and generally have resulted in appropriate action for improving tank car safety. However, through such control, chemical manufacturers and tank car owners also are capable of influencing decisions on matters pertaining to safety, such as tank car retrofits and tank designs, by giving undue consideration to the economic impact on tank car owners and shippers and thereby adversely impact the safety of railroad operations and public safety. Even though well intended, the Safety Board does not agree with the AAR that its industry-oriented membership on the Tank Car Committee can in all cases give fair representation to public safety concerns.

The removal of full center sills from beneath tank cars and the development of stub-sill tank cars without appropriate consideration as to the effect of this design change on the railroads and public safety is a prime example of such influence. The center sill withstood the buff forces generated during train movements, provided a safe location for attaching car equipment such as airbrake reservoirs, and provided protection during derailments for tank discontinuities such as bottom fittings and outlets. Since removal of the center sill, the investigations of derailments have revealed many needed safety improvements in the design of stub-sill tank cars for attachment methods and for protection of bottom discontinuities. Because the FRA took no part in the Tank Car

Committee deliberations on the design of stub-sill cargo tanks and because public participation in these deliberations was not otherwise achieved decisions were made without the public safety interests being independently identified and supported.

Had the FRA required the AAR to report any actions taken or to identify specific tank car failures, the FRA would have been alerted earlier about the numerous and varied types of attachment failures. These failures were documented by the AAR during investigations of derailments of stub-sill tank cars and through AAR-required applications and Report of Repairs, R-1. Further, the FRA should have recognized that the AAR had not developed and implemented a program for the periodic and thorough analysis of this failure data in order to identify failure trends among the classes and builders of tank cars. Earlier recognition of this problem should have induced the FRA to require protection of all bottom attachments and fittings rather than accepting the retrofit protection program of the AAR. Had the FRA reviewed the actions taken by the AAR concerning attachments, it also would have become aware that the present requirement of FRA for installing pads between attachments and tank shells made in 1971 in response to an AAR petition was not adequate.

The FRA should have implemented an aggressive program for identifying and assessing the adequacy of the actions taken by the AAR when it first delegated the authority for tank car safety. This program could have identified the imbalance on the Tank Car Committee and then it could have recognized the potential adverse effect this imbalance could have on tank car designs. The FRA easily could have determined that the engineering expertise for the design of tank cars resided almost exclusively with the RPI member and some of the trade organizations. Additionally, since the individual railroads are responsible for the losses which occur during transportation, the FRA should have questioned how this arrangement could meet the railroad industry's safety needs for the development of tank car standards much less the needs of public safety.

Thousands of tank cars in violation of FRA specifications were identified as a result of the Safety Board's investigation of the accident on December 31, 1984, at North Little Rock, Arkansas; yet the FRA did not take effective action to ensure that proper corrective actions were taken. If the FRA had been monitoring the AAR actions, it would have become aware more quickly of the inappropriate actions being taken by GATX and that these actions were being approved by the Tank Car Committee. Because the FRA did not monitor the AAR actions, the FRA was not aware that the AAR had approved GATX's initial application for retrofitting the noncomplying cars in violation of FRA tank car specifications. Today, the adequacy of the actions approved for retrofitting these tank cars remains unresolved and awaits the results of research and experience during the operation of the retrofitted tank cars.

Another issue identified during this review and still requiring resolution by FRA action was that the regulatory agencies charged with tank car safety responsibilities both in the United States and in Canada have not formally established procedures for exchanging information on tank car performance. There are no periodic meetings to exchange views and concerns about safety improvements for tank cars or to improve the operations of the AAR under the delegated authorities of both countries. The need for planned, periodic exchanges of information and views about matters of common concern is crucial. Since both countries apply the same standards to tank car design and both countries have delegated responsibilities to the AAR, it would be beneficial and practical to coordinate efforts.

While the AAR has recently implemented changes in its operations to exert greater railroad industry influence on decisions made by the Tank Car Committee, to open many of its records for review by appropriate governmental agencies, and to allow government regulatory agencies to attend portions of its meetings, the Safety Board does not consider these actions adequate if the AAR is to meet public safety interests. Using both the findings from this Safety Board review and from the FRA audit of AAR procedures, the FRA now must develop regulations and establish program objectives, procedures, reporting requirements, and determine that public safety interests relative to tank car safety are being adequately served. Among the many actions necessary, the FRA needs to establish procedures detailing the manner in which the Tank Car Committee must conduct this delegated public business, the qualifications of persons who serve on the Tank Car Committee, the mix of interests represented on this committee including the need for public-at-large members, the types and extent of records that must be maintained, the requirements for periodic reports to the FRA, the identification of the types of analyses which must be performed of tank car repair records and the frequency of performing these analyses, the conditions under which the retrofit of existing cars must be undertaken, and the provisions for FRA representatives to monitor any and all activities associated with actions taken by the Tank Car Committee. The FRA should coordinate its actions with the CTC to take advantage of its experience and concerns and to promote the development of a single program capable of meeting the safety needs of the United States and Canada.

As clearly pointed out by the Canadian Royal Commissioner following the CTC MacMillan Yard Inquiry (see appendix E), public participation in the Tank Car Committee deliberations affecting public safety is needed. The Safety Board concurs. The FRA should insure that the public safety needs are identified and supported in all of the FRA delegations to the AAR. Such an objective would insure that both the safety interest of the rail industry and the public are met.

CONCLUSIONS

Findings

1. The lack of early information about the products and numbers of tank cars involved in the derailment, while not seriously affecting the initial emergency actions, made it more difficult to coordinate the response activities.

2. Cabooseless train operations require additional procedures to compensate for this different method of operation in order to provide emergency response personnel timely and accurate information regarding derailed cars.

3. The emergency response guides used during the accident caused some confusion because the objectives of the recommended actions were not clearly stated and some terms were capable of multiple interpretations.

4. Toxic combustion effluents which threatened public safety generated by the burning phosphorus and sulfur were not recognized by all available emergency response guides.

5. While the molten liquid form of the products involved in this derailment served to facilitate their loading and unloading, its liquid form contributed to the spill size and amount of product released.

6. When transported by rail, molten sulfur presents unreasonable hazards to public safety and should be fully regulated as a hazardous material.

7. Local emergency response agencies effectively managed the response to this emergency and minimized threats to public safety.

8. The bottom rupture and major release of phosphorus occurred as a result of forces imposed on the tank car's unprotected brake support attachment and could have been prevented had the brake equipment been protected against derailment damage.

9. The derailed sulfur and tallow tank cars without their brake support attachments directly attached to the tank car tanks did not have their tank shells torn by attachment failures.

10. Industry was aware of the safety problem presented by the brake support equipment being welded directly to the tank car tank, yet action to correct this deficiency was not taken until after the accident at Miamisburg.

11. Before the Miamisburg accident, the AAR Tank Car Committee failed to identify attachments to tank shells on stub-sill tank cars as a significant failure mechanism.

12. The performance of the bottom attachment on the phosphorus tank car in this accident convinced the AAR Tank Car Committee that protective measures commensurate with the risk posed by hazardous materials transported must now be provided for existing unprotected tank cars.

13. The shelf couplers installed on tank cars involved in the derailment minimized the extent of damages to tank heads and maintained the relative positions of cars in the train during the derailment.

14. A shelf and nonshelf coupler connection does not provide adequate protection to prevent coupler override and tank head punctures.

15. Steel jacketing on tank cars reduced derailment damages and reduced flame impingement on the car tank shells.

16. The AAR Tank Car Committee provides the primary control over tank car safety both in the United States and in Canada because the regulatory agencies of both countries have delegated their authorities to the AAR.

17. The FRA has not established sufficient direction or controls over the AAR's implementation of the authority it delegated for tank car safety to assure that public safety concerns are appropriately balanced against industry economic interests.

18. The absence of effective FRA action for determining the adequacy of the AAR's implementation of the delegated responsibilities has resulted in an industry self-regulated system which does not provide adequate public safety accountability on decisions made affecting tank car designs, construction, and modification.

19. The FRA has not established appropriate reporting requirements under the authorities delegated to the AAR so that the FRA would have timely notification of potential tank car safety problems.

20. The FRA and the CTC do not participate in any formal periodic program for coordination and exchange of information on matters of common interests, such as, deficiencies in tank car designs and the appropriate use of the AAR in carrying out authorities delegated to it.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the uncontrollable release of phosphorus was the failure of the unprotected bottom brake support attachment during the derailment resulting in the tearing of the tank shell. Contributing to the rupture of the tank was the Federal Railroad Administration's failure to require retroactively that reinforcement pads be installed between tank shells and welded attachments.

RECOMMENDATIONS

As a result of its investigation of this accident, the National Transportation Safety Board reiterated Safety Recommendation I-81-1 to the Department of Transportation:

> Investigate the adequacy and consistency of hazardous materials emergency response guides and other advice available to local officials for use in controlling hazardous materials releases during transportation, and take necessary steps to assure that they provide sufficient and consistent guidance and advice to help local officials control hazardous materials spills quickly and effectively.

In addition, the Safety Board issued the following recommendations to:

—to the Federal Railroad Administration:

> Establish a procedure for evaluating throughout the life of the tank cars, the performance of all General American Transportation Corporation tank cars modified to remove the anti-shift bracket welded directly to the track to facilitate the early detection of any failures that may be associated with the tank shell thickness having been reduced by the modification process. (Class II, Priority Action) (R-87-46)
>
> Define explicity those authorities concerning tank car safety delegated to the Association of American Railroads and establish procedures governing the implementation of these delegated authorites. (Class II, Priority Action) (R-87-47)
>
> Require the Association of American Railroads to report on all actions taken under the authorities delegated for tank car safety. (Class II, Priority Action) (R-87-48)

Develop and implement a program for effectively reviewing and evaluating all actions taken by the Association of American Railroads, tank car repair facilities, and tank car manufacturers under the authorities delegated to them to determine that all actions comply with Federal requirements for tank car design, construction, modification, operation, and repair. (Class II, Priority Action) (R-87-49)

Evaluate annually the Association of American Railroads tank car specifications to determine that the instructions and guidance provided on tank car design and construction are consistent with Federal requirements. (Class II, Priority Action) (R-87-50)

Coordinate a formal arrangement with the Canadian Transport Commission for routinely exchanging information on the performance of tank cars, for meeting to discuss common safety concerns related to the design, manufacture, retrofit, and use of tank cars, and for establishing controls for and the oversight of the delegated authorities for tank car safety. (Class II, Priority Action) (R-87-51)

—to the Association of American Railroads:

Determine through analysis of its "Reports of Repairs" records the causes of tank car attachment failures. (Class II, Priority Action) (R-87-52)

Revise present attachment standards for new tank cars and require appropriate modification of existing tank cars based on deficiencies identified in its analysis of the causes of tank car attachment failures. (Class II, Priority Action) (R-87-53)

Establish a quality control program that includes on-site inspection to determine that tank car manufacture, repairs, modifications, and alterations are performed in compliance with the tank car specifications approved in applications. (Class II, Priority Action) (R-87-54)

—to CSX Transportation:

Establish crewmember procedures for providing timely, accurate information to on-scene emergency responders about the types of hazardous materials being transported in tank cars involved in derailments where "end-of-train" devices are used. (Class II, Priority Action) (R-87-55)

Reemphasize to all operating personnel the importance of directing their initial activities following a derailment to the cooperative support of local emergency response agencies. (Class II, Priority Action) (R-87-56)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ JOHN K. LAUBER
Member

/s/ JOSEPH T. NALL
Member

/s/ JAMES L. KOLSTAD
Member

PATRICIA A. GOLDMAN, Vice Chairman, did not participate.

September 29, 1987

APPENDIXES

APPENDIX A

INVESTIGATION

Investigation

The National Transportation Safety Board was notified of this accident at 6:30 p.m. on July 8, 1986, and immediately dispatched an investigator from the Chicago Field Office. An investigator-in-charge and other members of the investigative team were subsequently dispatched to the scene from Washington. Individual investigative groups were established for operations, track, tank car performance, hazardous materials, and emergency response.

Public Hearing

The Safety Board conducted a deposition proceeding as part of its investigation of this accident on December 17, 1986, at Miamisburg, Ohio. Parties to this proceeding included the CSX Transportation, City of Miamisburg, Ohio; Albright and Wilson, Inc., Association American Railroads, Union Tank Car Corporation, and the Federal Railroad Administration.

APPENDIX B

National Transportation Safety Board

Washington, D.C. 20594

RAILROAD ACCIDENT/INCIDENT SUMMARY

File Number:	DCA 86 HZ 003
Location:	Miamisburg, Ohio
Date and Time:	July 8, 1986, 4:25 p.m., e.d.t.
Railroad:	CSX Transportation
Type of Train:	Freight
Persons on Board:	Four crewmembers
Injuries:	None
Damage:	$3,540,000
Type of Occurence:	Freight train derailment
Phase of Operation:	En route on main track

About 4:25 e.d.t., July 8, 1986, southbound CSX Transportation (formerly Baltimore Ohio Railroad) freight train Extra 7614 South derailed 15 of the 44 cars in the train. The train was travelling about 45 mph at the time of the derailment. The derailed cars were the 24th through the 38th head cars of the train. The train was en route from North Dayton, Ohio, to Cincinnati, Ohio, with 1 locomotive unit and 44 cars. The train did not have a caboose. 1/

The derailment occurred at the site of a two-span through plate girder bridge about 163 feet in length. The derailed train was the second train to proceed over the track, after a track surfacing gang worked on the track north and south of the bridge.

The track at the accident location was a tangent single main track, proceeding in a southerly direction on a descending gradient of about 0.20 percent to the two-span through plate girder bridge spanning Bear Creek. Past the bridge, the gradient continued descending in a southerly direction at about 0.06 percent. A sidetrack extended parallel to the main track for about 3/4 mile on either side of the bridge on the west side of the main track. The main track was constructed of 132 pound RE section continuous welded rail (CWR), atop 9-inch by 7-inch by 8-foot by 6-inch-treated oak wood crossties, laid in crushed granite ballast which extended about 18 inches beneath the crossties and 12 inches or more past the ends of the crossties. The width of the ballast shoulder section decreased near the north end of the bridge. The spiking pattern consisted of two rail holding spikes per tieplate, and the rail anchoring pattern was box-anchoring on each crosstie in the accident vicinity. About 50 percent of the rail anchors were not against the tie faces in the general area of the derailment.

The bridge consisted of a two-span through plate girder bridge structure of open-hearth structural steel. The double track bridge rested atop reinforced concrete backwalls and a center reinforced conrete pier. The spans were 81 feet 6 inches in length.

1/ For more detailed information, read Hazardous Materials Accident Report--"Hazardous Materials Release Following the Derailment of Baltimore and Ohio Railroad Company Train No. SLFR, Miamisburg, Ohio, July 8, 1986," (NTSB/HZM-87/01).

Maximum allowable timetable track speed at the accident site was 50 mph, with a maximum allowable timetable track speed of 45 mph beginning 0.20 mile south of the bridge. The bridge was located at milepost 49.7. According to the FRA Track Safety Standards, the classification of the track was within the parameters of Class 4 track. Except for the damaged bridge and track structure, the original condition of which could not be documented, the track met or exceeded the requirements of the FRA's Minimum Track Safety Standards.

A programmed cyclic track surfacing gang had been raising the track in the vicinty of the bridge on the day of the accident. The track surfacing gang consisted of a combination tamper/liner, a ballast regulator, and a backup spot tamper. Manpower consisted of eight men with the track surfacing gang consisting of the machine operators, track laborers, and one foreman in-charge. The track surfacing was being performed out-of-face with a reported maximum raise of 3 inches in one pass. Out-of-face surfacing was performed north of milepost 49.7 and south of the bridge and was completed at 2:01 p.m. on July 8, 1986.

The U.S. Weather Bureau's recorded ambient temperatures for the general area on July 8, 1986, is as follows:

Time	Temperture
7:00 a.m.	72° F
8:00 a.m.	74° F
9:00 a.m.	79° F
10:00 a.m.	83° F
11:00 a.m.	86° F
12:00 noon	88° F
1:00 p.m.	88° F
2:00 p.m.	88° F
3:00 p.m.	90° F
4:00 p.m.	90° F
5:00 p.m.	90° F

CSX Engineering Department Procedure Bulletin R-39 provides that when the ambient temperature is expected to exceed 85° F and out-of-face surfacing operations have been performed at temperatures below 85° F, the imposition of a temporary speed restriction of 10 mph on the track being surfaced is required during the passing of 12 freight trains subsequent to the surfacing operation. The bulletin also requires the same 10 mph speed restriction to be imposed on the track not dressed or having a substandard ballast section. The track surfacing operations on the track in question began about 11 a.m. and continued until about 2 p.m.; no slow order was placed on the track after surfacing operations on July 8, 1986.

Observations made subsequent to the accident indicated that the track structure immediately north of the bridge shifted laterally. Inspection of the rails and the rail anchors in the section of track immediately north of the bridge did not indicate any sudden or recent longitudinal displacement of the anchors relative to the rail. The maximum lateral displacement of the track structure was measured about 5 inches to the west at a point about 35 feet to the north of the north backwall of the bridge.

Observations of the bridge structure indicated damage from impact with derailed freight cars as well as substantial thermal damage from a fire subsequent to the derailment. The north end of the bridge's north span was displaced about 28 inches to the east. Impact marks were noted on several freight cars which, although derailed, negotiated passage over the bridge and came to rest south of the bridge structure.

Damage assessments provided by CSX indicate that bridge 49.7 was destroyed in the accident, as was 457 feet of main track wth additional 1,950 feet of main track damaged and 500 feet of sidetrack destroyed.

The lateral shift of the track structure immediately north of bridge No. 49.7 is significant to the events of the derailment sequence. This lateral shift of the track structure measured a maximum of about 5 inches to the west at a point about 35 feet to the north of the north backwall of the bridge. It is improbable that this lateral shift of the track structure could have occurred due to the dynamics of the derailment sequence itself. The lateral force necessary to accomplish such a displacement typically manifests itself as rail turned over in the edge of the seat of the tieplates or as rail displaced laterally from the seat of the tieplate. Further, there were no indications, such as bent-over track spikes or tieplace displacement to support a theory of lateral track displacement resulting from the dynamics of the derailment sequence.

The lateral shift of the track structure was also unlikely to have occurred as a result of thermal stresses. Although thermal damage to the bridge structure was significant, the rail does not possess the degree of lateral rigidity that would have been necessary to transmit those stresses laterally and force the entire track structure intact, 5 inches through the roadbed. Further, the freight cars sitting on the track after the derailment and through the fire would have significantly arrested lateral shift of the track structure. The transmission of thermal forces longitudinally through the rails was not possible in this particular situation since the rails were not restrained on the bridge structure itself during the fire. Expansion of the unrestrained rails from the fire's heat could not have been transmitted through the restrained rails in the ballast roadbed.

Although the ballast shoulders surrounding the track structure north of bridge No. 49.7 were sufficiently wide, more than half of the depth of the crossties were exposed. This condition seriously impaired the ability of the ballast shoulder section to resist lateral forces. The ballast track section had also been disturbed by the out-of-face track surfacing operation conducted shortly before the derailment. The maximum raise of the track was reported to have been 3 inches, raised in one pass. The National Transportation Safety Board believes that it was poor practice not to have imposed a slow order on the track until the track could have regained stability.

The conditions noted at the accident site and the practice employed in the track surfacing operation indicate that the 5-inch lateral shifting of the track very likely occurred during the passage of the freight train, which in turn derailed due to the track shifting underneath. The dynamic forces imposed by the passing train in combination with the inadequate condition of the ballast section probably caused the lateral shift of the track structure. Whether the entire 5 inches of track shift occurred at once or some minor portion of the track shift was attributable to the derailment sequence or the thermal stresses could not be determined. See the attached brief of accident for the Safety Board's determination of probable cause for the derailment discussed in this summary report.

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

BRIEF OF ACCIDENT

File No. - DCA 86-HZ-003 | 07/08/86 | Miamisburg, Ohio | Time (Lcl) - 1625 EDT

---Basic Information---

Reporting Railroad - CSX Transportation
Type of Accident - Derailment
Operating Phase - En Route
Method of Operation - Traffic Control

Property Losses
Railroad - $430,000
Non-Railroad - $3,110,000

Fire
Yes

	Injuries			
	Fatal	Serious	Minor	None
Employees	0	0	0	0
Passengers	0	0	0	0
Motorist	0	0	0	0
Other	0	0	569	0

---Railroad/Personnel Information---

Train Data
Railroad - CSX Transportation
Type of Train - Freight
Train ID - Extra 7614 South
Direction - South
Speed (Est.) - 45
Speed (Actual) - 45

Train Consist/Damage
No. Loco. Units - 1
No. Cars/Caboose - 44/0
End of Train Monitor - Yes
Length (Feet) - 3,185
Trailing Tons - 3,737
Loco. Damaged/Derailed - 0/0
Cars Damaged/Derailed - 15/15

Crew Information
Front End - 4
Rear End - 0
Toxicology Performed - Yes
Results - Negative
Radio Communications
Radio Available - Yes
Operational - Yes

---Environment/Operations Information---

Weather Data
Weather Condition - Clear
Condition of Light - Daylight
Sight Distance - 5,000

Itinerary
Last Departure Point
North Dayton, Ohio

Destination
Cincinnati, Ohio

Hazardous Materials
Involved - Yes
Evacuation - Yes
Cars Involved - 1
Track Information
Owner - CSX Transportation
Type/No. of Tracks - Main/2
Gradient/Alignment - .2% Des./Tangent

---Narrative---

About 1625 EDT, July 8, 1986, a southbound CSX Transportation (formerly Baltimore and Ohio Railroad) freight train derailed 15 cars of the 44 cars in the train. The train was travelling about 45 MPH at the time of the derailment. The derailed cars were the 24th through the 38th head cars of the train. Three of the derailed cars were tank cars, one containing yellow phosphorous, one containing tallow, and the other molten sulphur. All three cars released their contents. A massive fire resulted in large evacuations of the local population. The derailment occurred at the site of a two-span through plate girder bridge about 163 feet in length. The derailed train was the second train to proceed over the track, after a track surfacing gang worked on the track north and south of the bridge.

BRIEF OF ACCIDENT, continued

File No. - DCA 86-H-Z003 | 07/08/86 | Miamisburg, Ohio | Time (Lcl) - 1625 EDT

Occurrence #1 - Derailment
Phase - Maintaining Speed

Finding(s)
1. Main track - Shifted
2. Track slow order - Not issued - Track Gang Foreman
3. Main track - Raised

Occurrence #2 - Rupture of Tank Car
Phase - Stopping

Finding(s)
4. Other underframe - Fractured

Occurrence #3 - Hazardous Materials Leak/Spill (Fumes/Smoke)
Phase - Stopping

Occurrence #4 - Fire
Phase - Stopping

---Probable Cause---

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are finding(s) 1, 2

Factor(s) relating to this accident is/are finding(s) 3, 4

APPENDIX C

SAFETY BOARD RECOMMENDATIONS FOR IMPROVEMENT OF HAZARDOUS MATERIALS OF TANK CAR SAFETY

Since 1968, the Safety Board has made 57 recommendations to DOT and AAR for improving tank car safety. Those recommendations issued by the Safety Board which are applicable to tank car safety are listed below by the subject of the recommendation.

Delegations

Recommendation	Status
R-69-011	Closed—Acceptable Action
R-78-028	Closed—Unacceptable Action

Data Requirements

R-79-016	Closed—Acceptable Action
R-80-014	Closed—Acceptable Action

Safety Analysis

R-69-028	Closed—Acceptable Action
R-72-020	Closed—Acceptable Alt.Action
R-75-016	Closed—Acceptable Alt.Action
R-78-029	Closed—Acceptable Action
R-78-030	Closed—Acceptable Action
R-78-033	Closed—Acceptable Action
R-78-059	Closed—Unacceptable Action
R-79-024	Closed—Acceptable Action
R-80-012	Closed—Acceptable Action
R-80-015	Closed—Unacceptable Action
R-81-074	Closed—No Longer Applicable
R-81-075	Closed—No Longer Applicable

Monitoring Repairs and Retrofitting

R-78-030	Closed—Acceptable Action
R-78-031	Closed—Acceptable Action
R-85-012	Open—Acceptable Action
R-85-023	Closed—Unacceptable Action
R-85-059	Open—Acceptable Action
R-85-060	Open—Unacceptable Action
R-85-099	Open—Acceptable Action
R-85-117	Open—Acceptable Action
R-86-043	Closed—Acceptable Alt.Action

Tank Car Design and Construction

Recommendation	Status
R-69-008	Closed--Acceptable Action
R-69-029	Closed--Acceptable Action
R-71-009	Closed—No Longer Applicable
R-71-010	Closed—No Longer Applicable
R-72-021	Closed—Acceptable Action
R-72-022	Closed--Acceptable Action
R-72-024	Closed—No Longer Aplicable
R-74-031	Closed—Acceptable Action
R-74-033	Closed--Acceptable Action
R-75-016	Closed--Acceptable Alternative Action
R-75-019	Closed--Acceptable Action
R-78-019	Closed--Acceptable Action
R-78-020	Closed—Acceptable Alternate Action
R-78-021	Closed--Acceptable Action
R-78-022	Closed—No Longer Applicable
R-78-058	Closed--Acceptable Action
R-79-023	Closed--Acceptable Alternate Action
R-79-024	Closed—Acceptable Action
R-79-028	Closed—No Longer Applicable
R-79-065	Closed--Acceptable Alternative Action
R-79-066	Closed--Acceptable Action
R-79-067	Closed--Acceptable Alternative Action
I-80-003	Closed—Acceptable Alternative Action
R-80-010	Closed—Acceptable Action
R-80-011	Open—Unacceptable Action
R-80-013	Closed--Acceptable Action
R-80-014	Closed—Acceptable Action
R-80-016	Open--Acceptable Alternative Action
R-85-061	Open—Acceptable Action
R-85-063	Open—Acceptable Action
R-85-064	Open—Acceptable Action
R-85-105	Open—Unacceptable Action

APPENDIX D

SUMMARY OF FEDERAL RAILROAD ADMINISTRATION DELEGATION OF AUTHORITY TO ASSOCIATION OF AMERICAN RAILROADS FOR TANK CAR SAFETY AND RELATED FRA AND AAR PROCEDURES AND OPERATIONS

I. DEPARTMENT OF TRANSPORTATION REGULATORY REQUIREMENTS

Title 49 CFR 179 Subpart A lists the requirements and procedures for securing tank car approval and changes to tank car specifications. The following requirements are delineated.

A. Delegation of Authority

179.3—Delegates to the Secretary, Mechanical Division, AAR, (Secretary) authority to issue, based on appropriate committee action, approvals for designs, materials, construction, conversion, and alteration of tank car tanks when such is compliance with DOT specifications.

B. Certification Requirements

179.1—Provides general requirements for tank cars. Requires that tank cars must be built to the specifications of 49 CFR Part 179, that cars built to specifications predating those of the current 49 CFR Part 179 may continue in use as provided by 49 CFR 173.31, requires persons performing any function prescribed in 49 CFR Part 179 must do so in compliance with 49 CFR Part 179.

179.5—Requires the party assembling a completed tank car to provide, before the car is placed into service, a Certificate of Construction (Form AAR 4-2) to the owner, to the B of E, and the Secretary certifying that the tank, equipment, and car completed comply with all the requirements of the specification (Department's). If the tank is of Class 106A, 107A, or 110A, then before it is placed in service, then the builder must also provide a Certificate of Inspector's Report certifying that the tank and appurtenances comply with all the requirements of the specifications. In addition, CFR 179 incorporates by reference specific AAR "approved" standards and practices in the AAR Tank Car Manual since 1982; 1/ however, approval is exercised by AAR based on current DOT and AAR requirements. The AAR requirements do not conflict with Federal regulations.

C. R-1 Report of Welded Repairs, Alteration, or Conversion

179.6—Allows repairs or alterations to be made to tank cars by following procedures of appendix R of AAR Specifications for Tank Cars - 1982 edition of the Tank Car Manual. AAR approval for specific repairs or alterations is generally not required if the procedures in Appendix R are followed or if the repairs or alterations were previously approved for other cars. Repair is defined to include reconstruction of a tank to its original design, and alteration means changes in tank or fittings that do not change the

1/ On April 19, 1987, RSPA adopted the 1985 Edition of AAR's Specifications for Tank Cars, M1002.

specification but which do change the Certificate of Construction. Thus, the discretion is granted to the Tank Car Committee to approve procedures and materials incident to repairs and alteration as long as they are in compliance with the applicable specification. Changes to appendix R of the Tank Car manual in any later edition (after 1982) have not been incorporated by reference in the DOT regulations, but no changes have been made which conflict with DOT specifications.

D. DOT Exemptions

179.3—Requires, when in the opinion of the Committee, such tank or equipment does not comply with DOT regulations and specifications then the Committee may recommend service trials to determine the merits of a change in specification. Service trials cannot be conducted unless authorized by the Department under the terms of "DOT Exemptions."

E. Proposals for Changes to the DOT Specifications

179.4—Delegates to the Secretary, AAR, the responsibility for progressing proposed changes or additions in the specifications for tanks. Provides for submission of application to use any specification change proposed but disallows the construction of any tank to the proposed specification until such specification is approved or DOT Exemption has been issued.

II. AAR PROCEDURES

The following AAR procedures cover the implementation of the above DOT requirements.

A. Tank Car Committee

General Committee.—Under AAR Standard S-046, Section 10.0, Approvals (M-1002), an item of equipment, practice, design, product, device or facility has been "approved" by the AAR Mechanical Division when it is found to meet the applicable standard, alternate standard, or recommended practice. The General Committee is responsible for the execution of the responsibilities for the Mechanical Division including the above "approvals."

The Tank Car Committee is a standing committee of the General Committee and is subject to the rules and guidelines of the General Committee; specifically under Circular No. D.V. 2077 -Articles of Organization (Revised 1986), the General Committee:

- designates the chairman and vice-chairman of the Tank Car Committee, the term of office is for 2 years;
- approves Tank Car Committee membership based on recommendations from "member roads" and "others" having responsibility for the design, construction, maintenance of car equipment;

- approves for the Mechanical Division, reports and recommendations of the Tank Car Committee docket in accordance with AAR Standard S-050; or

- any member of the Mechanical Division or anyone else (S-050) can request to have a specific matter docketed for consideration by the Tank Car Committee.

The Executive Director (Assistant Vice President-Mechanical Division) or delegated representative is responsible for establishing a file and record of all Tank Car Committee transactions; setting meeting dates for the Tank Car Committee at least twice a year; and attending the Tank Car Committee meetings.

The Secretary-Mechanical Division is required to maintain a complete record of the transactions of the Tank Car Committee.

B. DOT Procedural Requirements

Under 49 CFR Part 179, DOT requires the following procedures in securing car approval.

The procedure for tank car approval requires submission in the form prescribed, including detailed prints, to the Secretary for consideration by Committee on Tank Cars (Committee) and other appropriate committees. Approval or rejection is based on committee action to be issued by the Secretary. Applications can be approved only when, in the opinion of the Committee, such tanks or equipment complies with DOT regulations and specifications.

When, in the opinion of the Committee, such tanks or equipment do not comply with DOT regulations and specifications then the Committee may recommend service trials to determine the merits of a change in specifications. Service trials cannot be conducted unless authorized by the Department under the terms of DOT Exemptions.

C. AAR Approval Process

Under Section 1.3.6 (M-1002), the Tank Car Committee is authorized to approve the following:

- design and materials for fabrication, alteration, conversion or welded repairs;

- design and materials for all valves and fittings on tank cars;

- design, materials, and flow capacity ratings of safety devices used on tank cars; and

- revisions or substitutions of any valve or fittings, or the addition of supplemental valves or fittings to the tank or to those fittings covered by the certificate.

Under Section 1.4 (M-1002), the application for approval (4-2) of designs and materials must be submitted to the Secretary, Mechanical Division, the B of E, and the Tank Car Committee, and when required by AAR specification M-10001, to other appropriate committees for approval of brake systems and car structure. The RPI representative of the Committee does not receive applications and drawings.

The office of the Secretary may process and approve applications on the behalf of the Tank Car Committee provided such applications are with precedent in that they are similar to previously-approved applications; otherwise approval requires Tank Car Committee ballot by majority vote and no dissenting comments from the chairman, the B of E, or the Mechanical Division. Comments must state if they are based on violations of the specifications or represent a hazardous condition.

In securing approval for construction of tank cars, AAR has four requirements of the applicant. In that the car company must be an AAR certified shop, use only the AAR approved drawing in building the car, follow the AAR fabrication practices and inspections , and submit a car certification to the AAR; specifically:

Step #1. The car company must prove its fitness as an AAR certified shop. These certification procedures and detailed requirements for AAR approval of facilities for fabrication, assembly, alteration, conversion, repair and associated testing of tank car tanks are contained in appendix B of the AAR Specification M-1002, Specification for Tank Cars.

Step #2. The car company must secure approval from the AAR that the car design is in compliance with DOT specs. RSPA delegates to the Secretary, AAR authority to issue, based on appropriate committee action, approvals for design, materials, construction, conversion, and alteration of tank cars when such is in compliance with DOT specifications. These procedures employed for carrying out the delegated authority are covered in the tank Car Manual (M-1002) and the Mechanical Division's Articles of Organization (revised 1986).

Step #3. The car company must build the car according to the approved drawings and perform required AAR inspections. The procedures are listed in the Tank Car Manual.

Step #4. The car company must finally certify that the car complies with DOT requirements. The designated car company officer must certify that the car conforms to all applicable DOT and AAR requirements, including specifications, regulations, Rules of Interchange and the DOT Railroad Safety Appliance Standards. In addition, the car company must place the DOT specification mark on the tank car. The builder must submit a properly executed certificate of construction certifying that all functions performed by the builder complies with the requirements of 49 CFR Part 179.

D. Procedures for Changes to the Regulations

DOT Procedural Requirements.—49 CFR 179.4 requires applicant proposing new or changed specification to furnish information to justify the proposal including information on the properties of the lading and the method of loading and unloading.

The Tank Car Committee shall review at its earliest convenience the proposal. The Committee shall report its recommendations to the Department. These reports of recommendations may be submitted to the B of E, AAR, for its recommendation before action by the Department. The Department shall give due consideration to the expert opinion obtained in determining what, if any, action to take.

AAR Procedures for Considering Proposals Regarding Standards and Recommended Practices, Specifications and Rules (Standard S-050)

Proposals may be submitted by a railroad, car builder, component manufacturer, private car owner or any other person or organization to Director, Technical Committees, AAR Mechanical Division (Director). Director will review proposal and assign it to relevant technical committee.

Relevant technical committee or subcommittee thereof will review proposal and as a part of its considerations may request the proponent to submit additional information or to appear before committee or subcommittee to explain in detail and to answer questions not resolved by the written material.

One of two possible actions may be taken by committee. It may reject the proposal which requires notification to the proponent of the rejection along with a written explanation addressing matters raised by the proponent. The proponent then is able to resubmit its proposal with any additional information available for reconsideration by the committee.

The second action available is to "progress" a proposal. In this event, the technical committee must publish either in the Mechanical Division Circular Letter or in the committee's Annual Report its intention to progress the proposal and solicit comments from interested parties.

Comments to proposals must be considered by the appropriate committee before taking final action. The final action and an explanation of the action taken must be published in a Mechanical Division Circular and all commentors must be advised of the committee's response to comments.

Final actions by committees then must be submitted for approval to either the membership of the Mechanical Division at the annual meeting or the General Committee, Mechanical Division, at times between annual meetings. Approval by majority vote of either group may direct the committee to take final action which must be submitted for letter ballot vote to the AAR member railroads.

New or amended standards and recommended practices approved as above must be published in the Manual or Standards and Recommended Practices. New or amended revision of the Interchange Rules approved as above are referred to the Arbitration Committee for final action as to which rule, paragraph, and/or subparagraph will be modified and for development of the exact wording of the modified interchange rule.

III. MONITORING

The FRA monitors tank car safety in several ways. On a daily basis, FRA field inspectors monitor selected tank car facilities. In addition, FRA headquarters reviews accident/incident data and is now attending AAR Tank Car Committee and AAR Hazardous Materials Steering Committee meetings.

AAR monitors tank car safety in several ways. Facilities are inspected for recertification every 5 years, more often if warranted. AAR inspectors can audit tank car facilities and the performance of AAR-approved tank car work at any time. In addition, AAR Hazardous Materials Systems inspectors perform educational audits of tank car safety at B of E members' plants.

The railroads are constantly monitoring tank car safety in rail transportation and, as defective cars and components are identified, AAR systems are utilized to define car populations and to alert the railroads and effect removal of cars with deficiencies from service.

APPENDIX E

ASSOCIATION OF AMERICAN RAILROADS RESPONSES TO SELECTED QUESTIONS

The Association of American Railroads (AAR) provided the following in regard to a Safety Board request for additional information on March 20, 1987. The following questions along with the AAR responses have been grouped into three major areas covering: delegations of authority/requirements, procedures, and monitoring.

Department of Transportation Regulatory Requirements

A. Delegation of Authority

1. What individual(s) at the AAR has primary responsibility for tank car safety?

   The Assistant Vice President-Mechanical Division. This position has responsibilities that embrace general hazardous materials transport as well as all aspects of tank cars.

2. In what other areas in addition to CFR 179.3 is the authority delegated from DOT to the AAR?

   This question certainly can and should be answered by DOT; however, we can point to delegations in 173.31, 174.8 and numerous delegations in Part 179. A careful examination of 49 CFR will delineate the specific details.

3. Under CFR 179.3, is this authority further delegated from the Secretary to staff, representatives, and/or standing committees in the AAR?

   The delegation of authority, in accord with 179.3 is to the Tank Car Committee, who may seek specific expertise from other AAR technical committees.

4. With whom does the delegation of authority eventually end? What organizations do these individuals represent? Are the individuals authorized to vote in behalf of the organizations they represent?

   The delegation of authority is to the Tank Car Committee or the Bureau of Explosives, as indicated by the regulation. The Tank Car Committee members have direct technical expertise in hazardous materials transportation and are appointed from candidates recommended by individual railroads and industry associations. The qualifications of each representative is separately evaluated and approved by the Mechanical General Committee. The individuals vote according to the dictates of the technical expertise that they possess as related to the issues involved.

5. Does 49 CFR delegate discretionary authority to the AAR? In what specific areas?

   According to Mr. J. M. Mason's letter of August 27, 1986, certain provisions of Part 179 delegate discretionary authority to the Tank Car Committee.

6. In reference to Mr. Mason's letter of August 27, 1986, to Mr. A. Johnston, is the AAR in agreement with the points raised? Please explain.

   The AAR generally agrees with the conclusions of Mr. J. M. Mason's letter of August 27, 1986. The AAR does not enforce or promulgate requirements that are in conflict with the regulations.

7. What criteria exists for performing evaluations of the delegated authority and periodically assessing whether or not the delegation should continue? Frequency, periodic reporting requirements, at what level?

   DOT/FRA exercises oversight consistent with their responsibility. There is routine interaction between AAR and FRA, including attendance of FRA personnel at recent Tank Car Committee and Bureau of Explosives Steering Committee meetings. Circulation of periodic reports of Mechanical Division activities, Early Warning Letters, and Maintenance Advisories Letters are regular practices. Also, there are numerous written inquiries from FRA to AAR concerning condition and status of rail equipment. Information exchanges and inquiries occur at both management and working levels. Formal communications are normally between the Associate Administrator for Safety and the AAR Assistant Vice President-Mechanical Division.

B. Certification Requirements

1. Under CFR 179.5 why does the B of E get a copy of the application in addition to the Secretary?

   The Bureau of Explosives is copied for coordination purposes. The intent is to apply the widest possible scope of expertise to the application approval process.

2. Car owners are certified according to which edition(s) of the Tank Car Manual?

   Certification is to the current issue of the Specification for Tank Cars. It is realized that in some instances there is a time delay in DOT's incorporation by reference of AAR's current issue; however, past differences have mainly only been of an administrative nature. The AAR is not aware of any cases where use of current versions of standards has resulted in substantive safety and/or regulatory concerns.

C. R-1 Report of Welded Repairs

In reference to Mr. A. Johnston's letter of August 12, 1985, to Mr. J. Walsh, AAR maintains that "repairs and alterations to tank cars are governed by appendix R of AAR Specification for Tank Cars pursuant to 49 CFR 179.6 and by 173.31, not by

the Part 179 requirements." Please explain the basis for this interpretation. Have other R-1's been submitted which allowed old cars to be repaired without meeting Part 179 requirements? If so, under what conditions? If so, number of cars affected?

Rather longstanding past industry practice is not in complete accord with Mr. J. Mason's letter of August 27, 1986. Clarification is being sought at this time. We are aware of no R-1's that have been inconsistent with the regulations and interpretations that were in effect when the forms were submitted. Where mandated, retrofits have been effected in accord with the provisions of subsequent rules.

D. DOT Special Permits

1. Are these practices still in effect? When are they employed?

Traditionally, proponents have gone directly to DOT for approval for deviations from the regulations.

2. In what specific area has the Committee used this delegation? Examples.

The Tank Car Committee has exercised the delegation only to advise proponents to seek exemption directly from DOT. Service trials which may be in conflict with the regulations are handled in the same way.

E. AAR Proposals for Changes to DOT Specifications

1. Under Section 2.3 (M1002) car companies must meet the "proposed revisions" to the specifications regardless if they are adopted or not by DOT. Why is the AAR seeking DOT's approval? Has DOT previously rejected an AAR proposal for changes to tank car specifications under Section 2.3?

Section 2.3 of M-1002 is consistent with or exceeds the regulations. AAR seeks DOT approval and publications to make the regulations as stringent as need be for maximum safety. Certain AAR proposals have been rejected and subsequently approved with appropriate modifications.

2. What AAR proposals for regulatory changes have been docketed by the Tank Car Committee for 1987?

A review of the March 1987 Tank Car Committee agenda shows the following proposals for regulatory changes:

Docket	Subject
T76.16-85	Alternate Gasket Materials for Liquefied Flammable Gas Service
T73.6-86	Outage Requirements
T79.4-83	Obsolete Specifications

T94.14-84	Yield Strength vs. Ultimate Strength for Shell Thickness
T94.16-85	Minimum Wall Thickness Requirements
T95.7-81	Use of Steels in Tank Cars
T95.10-82	Alloy Steel Castings
T-75.7-86	Removal of Commodity Stencil From Cleaned Tank Cars

3. What is the Subcommittee on Specifications?

   The Subcommittee on Specifications no longer exists. It was replaced 15 years ago by the members of the Tank Car Committee, functioning as two subcommittees in considering the proposals that have been developed by subordinate working groups. Recommendations of the Subcommittees are further considered by the full committee at its meetings.

4. Since the B of E is also part of the AAR, for what reasons would applications and proposals be referred to the B of E?

   See our response to V.B.1.

5. Who in the B of E receives and reviews the above? What are those persons qualifications?

   The properly constituted Steering Committee of the Bureau of Explosives addresses all referrals. Qualifications of staff personnel are duly reviewed. The AAR O-T General Committee approves appointment of all Steering Committee members based on technical qualifications. Generally, B of E personnel are qualified over a broad spectrum of hazardous materials concerns.

6. What records of AAR proposals are kept and to whom are they available? Under what conditions?

   AAR staff supporting the Tank Car Committee and the Bureau of Explosives Steering Committee maintains lists of present and past petitions to DOT. These are public documents and are readily available.

Procedures

A. Tank Car Committee

1. Who may serve on the Committee?

   All who are technically qualified and duly appointed under the bylaws and authority of the AAR Mechanical Division General Committee.

2. How is the committee constituted?

   The committee is constituted in accord with the referenced bylaws. Currently there are 16 voting members authorized.

3. What organization does the Chairman of the Tank Car Committee represent? Ethyl Corporation/CMA?

   The chairman of the Tank Car Committee serves the committee to facilitate its deliberations. The current chairman, who took office in 1985 and will step down in June, 1987 is employed by Ethyl Corporation, which is a member of CMA.

   Provide same information for other members of the committee.

   At present there are 10 railroad and 6 non-railroad voting memberships authorized.

4. What procedures must the Committee follow in carrying out the delegated authority?

   Committee procedures are conducted in accord with Robert Rules of Order. Agendas are prepared and issued prior to meetings, and minutes are recorded and kept. Proponents are offered the opportunity to present evidence at predetermined and dedicated portions of meetings. Tank Car Committee members who may have a semblance of conflict of interests on certain dockets are not permitted to be present during discussion and voting on these subjects.

   The Tank Car Manual (M-1002) prescribes procedures to be followed in considerations of applications for approval of designs and for facility certification.

5. What records of the Committee must be open for public inspection? For FRA inspection? Other inspections and by what organizations?

   Public inspection is available on appropriate request. FRA has availed itself of the right to audit transactions as deemed necessary. In certain circumstances legal depositions have been honored.

6. Define the term "majority" as it relates to the number of Committee votes necessary for approval of an action?

   Majority means a plurality of the voting members present, provided that a prescribed quorum exists. Letter ballots must have a majority of all eligible voting members.

   - Do all members have to vote for an action to receive approval?

   It is not necessary for all members to vote for an action to receive approval. A majority of a quorum is sufficient at meetings.

- Is this procedure always followed?

Yes.

- Do specific interest groups (car manufacturers, railroads, etc.) abstain from voting on certain dockets? Which groups vs. which types of actions? Trends?

Members abstain when there may be a potential conflict of interest or a direct involvement. Moreover, they absent themselves from all discussion and voting on such propositions.

7. What special interest balance is required in appointing Committee members?

At the present time the balance prescribed by the Mechanical Division General Committee is 10 railroad and 6 non-railroad voting members, with the chairman appointed (and properly approved) from among the railroad members.

8. How are public safety concerns introduced, supported, and weighed in the final voting?

Both railroads and the non-railroad members have a lot at stake if any deficiencies in safety occur. Final voting invariably reflects this fact. The safety performance record of hazardous materials transportation by rail is the bottom line and is, we believe, extraordinarily commendable.

9. What are the other AAR committees to which applications may be submitted?

All applications are submitted to and final disposition is made by the Tank Car Committee.

Other AAR committee, such as the Hazardous Materials Systems (BOE) Steering Committee, the Car Construction Committee and the Wheels, Axles, Bearings and Lubrication Committee are called upon by the Tank Car Committee as needed to supply specific expertise to address issues associated with the safe transportation of hazardous materials by rail. Recommendations from these committees are considered in the decision process; however, actions on applications rest solely with the Tank Car Committee.

- What are the qualifications of their memberships and their makeup?

Qualifications are based on expertise in the particular technical discipline needed for the committee. Such qualifications are offered in writing for each candidate from officers of the sponsoring organization and are approved by the Mechanical Division General Committee, which is comprised of the Chief Mechanical Officers of member railroads.

- What procedures must they follow?

The procedures utilized are stipulated in the bylaws of the Mechanical Division.

- What weight might they have in approval or rejections?

See above.

- What records must be maintained? What records are open to inspection and by what agencies or entities?

Records are kept, maintained and are available as described in the response to V.A.5.

B. Procedures for Changes to the Regulations

Under what conditions are AAR proposals for changes to DOT Specifications on tank cars submitted to the DOT for review? Was the proposal dated 1-23-81 by R. Thelen (T-94.2-80) submitted to the DOT? If not, why not?

AAR-adopted proposals for changes to DOT specifications for tank cars are always submitted in petitions to DOT. Mr. Thelen's letter of January 23, 1981, which you have referenced, was not such a proposal.

C. AAR Approval Process

1. Why and how are the AAR's M-1002 standards different from the FRA standards?

Any differences can be attributed to the basic philosophy that the federal regulations contain the requirements and the AAR M-1002 standards specify the methodologies of accomplishment. There are certain instances where AAR specifications go beyond FRA requirements. This is because these AAR standards are formulated to provide additional safety margins and thus can exceed minimum federal requirements.

2. How does the AAR see these two standards as different/or similar? Are both necessary?

See reply above.

Both are necessary in order to provide details for implementation and to facilitate sufficient attention before the condition specified in the federal requirements is reached.

3. Does AAR grant approval of alterations and repairs based on the latest edition of the Tank Car Manual?

AAR does approve alterations and repairs based on the current issue of M-1002.

- In this area, were deviations from the DOT specifications allowed?

No.

- Were the builders/repairers aware of the difference?

Builders/repairers should be confident that no differences on any consequence exists.

4. Is the GATX anti-shift bracket an example of the above? Specifically what is the minimum allowable shell thickness permitted by AAR? And DOT? How has this difference been resolved?

DOT regulations specify shell thickness. Until recently there were no indications that shell thickness was a regulatory or enforcement issue. The after-the-fact interpretation questions currently on the table are in the process of being resolved. As always Tank Car Committee procedures will be altered to agree with latest decisions.

Monitoring

1. Are all R-1's used to determine trends or identify critical defects in accident? How is this assessment made? Please cite a few examples where critical defect in tank car components have been identified on the basis of R-1 report reviews. Describe the data storage and retrieval system used?

R-1 forms are reports of repair, alteration or conversions made to tank cars in accord with previously approved procedures. Patterns of repair vs. operating experience are often used for correlation purposes. Assessments are made through analytical comparisons by AAR staff members. One example was in the detection and isolation of non-pressure stub sill tank car buckling tendencies, wherein a retrofit modification was imposed.

All tank car attributes are submitted and contained in a file of certificates of construction. Both manual and automated data processing systems are available to assist in analysis. A mechanized data base of equipment details (UMLER) is also regularly utilized.

2. Does the AAR have a critical defect program for identifying defective tank car components and advising the industry when a critical defect is identified? What procedures must be followed?

Defective tank car components are identified and traced chiefly by the "hands on" experience and monitoring efforts of the railroads who are intimately involved in the movement of the cars. Appropriate AAR committees determine severities and recommended remedies to the Tank Car Committee, depending on the particular nature of the problem.

Established Early Warning and Mechanical Advisory systems are used to alert railroads and to effect removal of cars with deficiencies from service.

3. When a problem is identified in a portion of a car owner's fleet, what procedures does the AAR require the car owner to take in identifying the problem? When is the FRA involved?

When a problem is identified, the car owner, shipper or other involved parties are requested to furnish supplementary information, and usually is invited to

present evidence and answer specific questions posed by the Tank Car Committee. FRA is notified of all verified significant problems that concern hazardous materials transportation.

4. What assurance is there that the problem is restricted only to the group of cars the manufacturer removed from service?

Appropriate record searches are utilized by AAR to uncover car similarities and/or past incidences. However, there are other strong reasons why the car owner or shipper having been notified of a potential problem, responds in a responsible manner. The owner or shipper recognizes the liability incurred by knowingly permitting cars with identified problems to continue to operate.

5. Were the above procedures followed by car companies and AAR following North Little Rock, Arkansas; Elkhart, Indiana; Seattle, Washington (Richmond Tank Co.); and Miamisburg, Ohio? Are these actions adequate in identifying permanent solutions to industry-wide problems? How? Why?

The above procedures have been followed whenever a problem has been identified. We believe that the resultant AAR actions have generally been adequate. The tank car safety record is extremely good. Of course there is always room for improvement, and AAR is evaluating and implementing new tools and procedures to upgrade effectiveness.

APPENDIX F

EXCERPTS FROM RELEVANT EMERGENCY GUIDES FOR PHOSPHORUS

DOT Guide #38, 1980

Fire

Some of these materials may react violently with water.
Small Fires: Dry chemical, soda ash or lime.
Large Fires: Flood with water.
Do not get water inside container.
Move container from fire area if you can do it without risk.
Cool containers that are exposed to flames with water from the side until well after fire is out.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles. If this is impossible, withdraw from area and let fire burn.

DOT Guide #38, 1984

Fire

Small Fires: Cover with sand, earth or water spray and keep it wet.
Large Fires: Water spray, or fog.
Do not scatter spilled material with more water than needed for fire control.
Move container from fire area if you can do it without risk.
Cool containers that are exposed to flames with water from the side until well after fire is out.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles. If this is impossible, withdraw from area and let fire burn.

AAR/Chessie System Form
Emergency Handling Precaution for Hazardous Commodity 4916141
Phosphorus, White or Yellow, in Water

If material on fire or involved in fire:
Flood with water.

When fire is out, cover all suspected material with wet sand or earth, until material can be permantely disposed of.

Envirnomental considerations—water spill:

Use natural deep water pockets, excavated lagoons, or sandbag barriers to trap material at bottom.

Environmental considerations—air spill:

Apply water spray or mist to knock down vapors
Combustion products include corrosive or toxic vapors

National Fire Protection Association Guide 49: Phosphorus

Phosphorus, White, or Yellow

Description: Colorless to yellow, translucent, soft waxy solid.

Fire and Explosion Hazards: Ignites spontaneously on contact with air at or above 80° F. Explosive when mixed with oxidizing materials.

Life Hazard: Fumes from burning phsophorus are highly irritating but slightly toxic except in very high concentrations. Solid yellow phosphorus causes severe burns. Avoid skin or eye contact.

Personal Proctection: Wear flame-retardant full-protective clothing.

Fire Fighting Phases: Deluge with water, taking care not to scatter, until fire is extinguished and phosphorus has solidified. then cover with wet sand or dirt.

Reactivity:

Sulfur: when a mixture of sulfur and yelow phosphorus is warmed, the two elements unite in all proportions with vivid combustion and power explosions.
Ann. Chim. et Phys. (1) 4:1 Ann. Chim. et Phys. (2) 67:332 Comp. Rend. 96:1499, 1771. R. Bottger, J. Prakt. Chem. (1) 12:357 (1837). See Phosphorus plus Cesium.

CHEMTREC: File Card for Phosphorus

For phosphorus tank car fire:

Cool with water from the side
Stay up-wind
Use unmanned hose monitors; if unable to withdraw
Do not use high pressure hose stream; use flooding amounts of water spray or fog
Refer to DOT ERG(1984) for guide reference; reactivity: avoid air, organic matter, peroxides, etc. produces P_4O_8

CANADIAN EMERGENCY FORM FOR PHOSPHORUS

URGENT

SPECIAL COMMODITY

Phosphorus, Yellow, Under Water UN 1381

Spontaneously combustible 4.2

Immediate Action Information
on other side of this sheet

GENERAL CHARACTERISTICS

Phosphorus is a wax-like solid, insoluble in water. It is usually shipped under a blanket of water to protect it from air. If the phosphorus becomes exposed to air it spontaneously ignites. Contact with the material causes severe burns. It is extremely poisonous by ingestion.

Boiling point: 280 °C
Melting point: 44°C

POTENTIAL HAZARDS

Fire:

Ignites spontaneously when dry. Reacts violently with organic compounds and many other chemicals. Heated containers may rupture violently. Water is the best fire fighting agent for large fires. On burning, releases dense irritating white fumes.

Explosion:

Not explosive but, when contained, heating may cause a violent rupture. Contact with certain reactive materials may cause an explosion.

Health:

Contact with skin or eyes may cause severe burns. Irritant fumes are produced during combustion. Some effects of inhalation may be delayed for 24 hours. Residues from decomposition are corrosive. Highly toxic if swallowed.

MARCHANDISE SPÉCIALE

Phosphore, Jaune, Recouvert d'eau UN 1381

Matière s'enflammant spontanément 4.2

Mesures d'urgence au verso

RENSEIGNEMENTS GÉNÉRAUX

Le phosphore est une solide cireux, insoluble dans l'eau. Il est normalement expédié immergé dans l'eau pour le protéger de l'air. Si le phosphore est exposé à l'air il s'enflamme spontanément. Un contact avec ce produit causera des brûlures sévères. Il est extrêmement toxique par ingestion.

Point d'ébullition: 280°C
Point de fusion: 44°C

DANGERS

Incendie:

S'enflamme spontanément à l'état sec. Réagit violemment avec les composés organiques et divers autres produits chimiques. Les contenants surchauffés peuvent se rompre violemment. L'eau est la meilleure substance pour combattre les incendies majeurs. En brûlant, dégage une fumée blanche dense et irritante.

Explosion:

Le phosphore n'est pas explosif. Toutefois, lorsque enfermé, un risque d'explosion peut se produire si la température est suffisamment élevée. Le contact avec certains matériaux réactifs peut provoquer une explosion.

Santé:

Le contact avec la peau ou les yeux peut causer de sévères brûlures. Il y a dégagement de vapeurs irritantes lors de la combustion. Certains effets de l'inhalation peuvent être retardés de 24 heures. Les résidus provenant de la décomposition sont corrosifs. Fortement toxique si ingesté.

URGENT

Emergency Response Form
SPECIAL COMMODITY
Additional information on other side

Phosphorus, Yellow, Under Water UN 1381

Spontaneously combustible 4.2

Fiche de sécurité
MARCHANDISE SPÉCIALE
Renseignements additionnels au verso

Phosphore, Jaune, Recouvert d'eau UN 1381

Matière s'enflammant spontanément 4.2

Car / Wagon: X
Trailer / Remorque:
Container / Conteneur: No UTLX 79499
Content Weight / Masse du contenu: 180,693 LBS
If compartmentized check one / Si le produit se trouve dans un compartiment, cocher: A B C D

Shipper-designated 24-hour emergency telephone numbers / Nos. de téléphone fournis par l'expéditeur en cas d'urgence (24 heures sur 24)

514-652-2911

IMMEDIATE ACTION INFORMATION

General:
Keep upwind. No unnecessary personnel. Avoid contact with the material and inhalation of fumes. Wear full protective clothing and self-contained breathing apparatus (SCBA). Do not handle broken packages without full protective equipment. If safe procedures permit, transport unbroken containers to a safe place. Isolate hazard area. Minimize escape of phosphorus or of water which has contacted it.

Spill or leak:
Stop leak if without risk, or cool container to solidify contents. Notify the shipper immediately that experts are required for area decontamination. Build dikes as necessary and keep spilled material covered with water. Keep area wet with flooding quantities of water spray. If possible, collect run-off water for subsequent recovery. Remove clothing suspected of contamination as soon as possible and wash or immerse in water immediately.

Fire:
Cover small fires with water, sand or earth. For large fire, use a low pressure water spray. Use water in flooding quantities as a fog. If an engulfing fire threatens but safe procedure permits, set up unmanned hose streams. Use water to cool containers exposed to fire.

First Aid:
Wash material from skin with water. Flush eyes and skin burns with low pressure water for at least 30 minutes, or cover skin burns with wet dressings soaked in 5% sodium bicarbonate solution. For burns, swallowing or fume exposure, prompt medical attention is essential. If fumes have caused difficult breathing, administer oxygen. If swallowing of phosphorus or of the blanketing water is suspected, induce vomiting. Keep patient at rest.

MESURES D'URGENCE

Consignes générales:
Rester en amont du vent. Pas de personnel inutile. Éviter tout contact avec le produit et l'inhalation des vapeurs. Porter une tenue de protection complète et un appareil respiratoire autonome. Ne pas manipuler des emballages abîmés sans équipement de protection complet. Si la sécurité le permet, transporter les contenants non endommagés dans un endroit sûr. Isoler la zone dangereuse. Minimiser l'échappement du phosphore et de l'eau qui y est entré en contact.

Déversement ou fuite:
Supprimez la fuite, s'il n'y pas de risques ou refroidissez les contenants avec de l'eau pour solidifier son contenu. Demander immédiatement à l'expéditeur d'envoyer des experts pour nettoyer la zone. Au besoin, endiguer et garder le produit recouvert d'eau. Garder la zone mouillée avec des quantités abondantes d'eau en pluie. Si possible ramasser l'eau phosphorée pour réutilisation. Enlever le plus tôt possible tout vêtement pouvant avoir été contaminé et laver ou immerger dans de l'eau immédiatement.

Incendie:
Pour les incendies mineurs, recouvrir d'eau, de sable ou de terre. Pour les incendies majeurs, utiliser de l'eau à basse pression sous forme de pluie. Arroser abondamment avec de l'eau en brouillard. Si l'incendie menace et que la sécurité le permet installer des boyaux fixes, non opérés par du personnel. Utiliser de l'eau pour refroidir les contenants exposés au feu.

Secourisme:
Laver la peau avec de l'eau pour enlever le produit. En cas de brûlure, rincer abondamment les yeux ou la partie touchée avec de l'eau à basse pression pendant au moins 30 minutes, ou mouillez-les avec un linge imbibé d'une solution de bicarbonate de soude 5%. Suite aux brûlures, à l'ingestion ou à une exposition aux fumées, des soins médicaux urgents sont essentiels. Si la victime a respiré des fumées de l'incendie, administrez-lui de l'oxygène si la respiration est difficile. Provoquer le vomissement si l'on suspecte l'ingestion du phosphore ou de l'eau phosphorée. Garder la victime au repos.

Placard Notation: "SPONTANEOUSLY COMBUSTIBLE 4" PLACARDS APPLIED
Mention d'étiquetage: PANNEAUX "INFLAMMABLE SPONTANEMENT 4" APPLIQUÉS

Shipper / Expéditeur: ERCO, a division of Tenneco Canada Inc. / ERCO, une division de Tenneco Canada Inc.
Consignee / Destinataire: A & W INC
Date shipped / Date d'expédition: JUNE 27/86

Origin / Origine: VARENNES (QUÉBEC)
Destination / Destination: FERNALD, OHIO, U.S.A.
Routing / Itinéraire: CN - GTW DETROIT, C+O

Signature

APPENDIX G

CANADIAN RAILWAYS TRANSPORT COMMITTEE BOARD OF INQIRY: MACMILLAN YARD ACCIDENT

CTC'S RELATIONSHIP WITH AAR

Prior to CP Rail's accident at Mississauga, with its immediate holocaust that enveloped most of the 21 tank cars derailed, the prevailing philosophy of the Canadian Transport Commission in certain critical areas of expertise was to rely heavily on the Association of American Railroads (the AAR). Design and specifications of tank cars were considered to be the province of the competent and knowledgeable Tank Car Committee of the AAR. The assignment of such responsibilities to the jurisdiction of the trade association of American railroads was not perceived, at the time, as being in any way unusual -- it was, or so it seemed, just being practical.

This ingrained philosophy persisted as tank cars got bigger and their respective ladings ever more diverse and deadly. The thinking was on a more positive note in the months leading up to Mississauga but it was not, as yet, distinguished by involvement and action.

The void did not escape the attention of the Grange Royal Commission inquiry. The Canadian General Transit Company, pointing to the void, proposed to the Royal Commission that it be filled in this way:

> "A trade association or branch of the CTC ought to be created to re-evaluate performance standards of all safety devices and analyze all retrofit proposals on a cost/benefit/risk basis. This body ought to have the research capability and liaise with the DOT, FRA (Federal Railroad Administration), RPI (the Railway Progress Institute -- suppliers of equipment to railways), AAR and appropriate trade associations such as the Chlorine Institute."

The Royal Commissioner himself addressed the matter in his report. Dealing with the CTC Red Book, at page 113 of his report, he stated:

> "The difficulty, if there is one, is that it follows almost inevitably that the initiative in the field lies with the AAR. While Canadian railways and indeed Canadian manufacturers and shippers are members or associate members of that organization there is no contribution to its deliberations on behalf of the Canadian public."

Later, turning to problems demonstrated at Mississauga with tank cars, the Royal Commissioner at page 152 of his report, stated:

> "These problems are all being worked on but they are not being worked on in Canada. Their solution seems to be left to the AAR Tank Car Committee which may perhaps be affected by the recommendations of the National Transportation Safety Board. I have no doubt that the Canadian railways and the Canadian tank and car manufacturing

> companies and shippers contribute to the AAR deliberations, but it is not in my opinion enough to rely on private and American efforts. We are concerned with the transportation of dangerous goods in Canada. We must take advantage of all knowledge to be obtained from any source but we must also attack the problems from the viewpoint of the Canadian public and I am sure there is in Canada knowledge and talent available to help."

Canadian National Railways, as one of the chief parties to the inquiry I conducted (the incident having occurred in its yard), addressed the concerns and opinion that, through the words of Mr. Justice Grange, I introduced for consideration of the parties. In final argument, CN produced a succinct statement as to the purpose and functions of the AAR. There seems to have been little actual evidence about AAR, although there were very many references to it. I am aware, of course, that my colleagues and the parties to the inquiry all know the role of AAR. So that the record will be clear in this report, and as background to the views of parties who responded on this subject, I avail myself of relevant information about AAR as found in the CN argument.

CN pointed out that the most important role of AAR -- an association of almost all North American railways -- involved the setting and enforcing of rules and standards relating to the interchange of both traffic and equipment. It provided a forum in which matters of common interest could be discussed and analyzed. According to CN:

> "It is a self-regulating agency which can provide technical, and other, assistance both to its members and any other group that requires its expertise. The Association is interested in safety matters and efficient and technically correct operation of the railways and its membership is such that it can draw upon a substantial body of technical knowledge."

CN emphasized, too, the activity of AAR relating to international trade and, in consequence, the interchange of equipment back and forth across the United States-Canadian border:

> "It is also important to bear in mind that the AAR operates in a geographical territory over which no single regulatory body has complete jurisdiction and, thus, to a large extent, performs a necessary coordinating function."

CN stated that "a parallel can be drawn between the AAR in railway transportation matters and Lloyds of London in maritime shipping matters".

CN also gave me its views on the matter at hand. These are as follows:

"Admittedly, the AAR does not possess a status similar to a regulatory agency but, it is our submission that this Association is in an excellent position to provide enlightened and meaningful advice to regulators and industries on both sides of the border. For example, the AAR, working in conjunction with the tank car companies, has investigated the causes of all significant loss of lading incidents and, as a result of these investigations, suggested to regulatory bodies major improvements to tank car head shields, insulation and top and bottom shelf couplers (here, reference may be made to the testimony of Dr. Harris at the 1981 Show Cause Hearing given at Hull, Quebec on April 27, 1981, Volume 5, pages 608 to 622). Such advice is given with a view to improving safety and protecting and enhancing international trade. It is respectfully submitted that the RTC would be ill-advised to ignore the advice, and the contribution, of a body of experts of this nature.

It is respectfully submitted that, in the present case, the AAR can be relied upon to assist Canadian railways to coordinate with the RTC in eliminating the problem that has obviously provoked concerns. The RTC has undertaken the investigation necessary to determine the cause of the incident MacMillan Yard and, further, has taken immediate steps to ensure that there are no other cars with a similar defect operating on Canadian Railways. Thus, in our submission, the RTC has acted quickly to eliminate the problem without adverse effects in the realm of international trade between Canada and its much larger partner, the United States.

Clearly, however, the RTC is in no position to ignore the long-term objective of ensuring that cars produced in the future will not have a similar defect, but, it is our submission, that this objective is best pursued simultaneously in both Canada and the United States. Only then can the RTC be assured that the long-term objective of this Inquiry (ensuring that no more cars with a similar latent defect appear on our Railways) is achieved without intolerable consequences for international competitive position of Canadian shippers and railways. Again, reference may be made to the decision of the RTC panel sitting on the 1981 "Show Cause Hearing":

> "In imposing safety programmes on the Railways under its jurisdiction, the Committee must therefore have regard to their probable cost and their effect on the competitive position of the Railways vis a vis other modes of transportation. This

> national transportation policy also prescribes as objectives protection of the interests of the users of transportation and the maintenance of the economic well-being of Canada. It declares that an economic, efficient and adequate transportation system making the best use of all available modes of transportation at the lowest total cost is essential in meeting these objectives. These statutory objectives also point out the requirement to ensure that interchange of commodities, development of industry and export trade are not unduly obstructed (at pages 11 and 12)."

In summary, though Canadian Railways must be regulated by the proper Canadian authority, it is essential to recall that such regulation cannot take place in a vacuum; it occurs in an international context, and in some cases, the regulator must carefully weigh the consequences his actions will have on international trade. In the present case, independent Canadian action could have severed economic consequences while coordination with other bodies concerned with North American railway traffic would avoid such consequences."

Procor Limited, in final argument, favoured me with their views on the comments and opinion expressed by Mr. Justice Grange. Procor stated:

> "What he had in mind was not ignoring or duplicating the present system for tank car design and improval that is part of the work of the AAR Tank Car Committee; rather, he suggested that that process be augmented where necessary to adequately respond to Canadian problems. What he had in mind was that the CTC itself have an independent research activity."
>
> "This hearing and the work of the CTC staff clearly demonstrates the independent position of the CTC at the present time in dealing with Canadian problems."

Procor was of the view that, in the circumstances of the inquiry, my reliance upon the Technical Committee was both consistent with the role Mr. Justice Grange envisioned that public authorities would play and would be the most appropriate and efficient response to questions raised by the MacMillan Yard incident.

The Government of Ontario, in final argument, dealt with the comments and opinion of Mr. Justice Grange. The Government pointed out that the Technical (or Advisory) Committee which had assisted the inquiry had been unanimous in the view expressed to me in their report:

> "Recommended that the AAR Tank Car Specifications would be the best place to introduce all of the above mentioned recommendations most efficiently. The Tank Car Committee of AAR should be approached to process those recommendations. Unanimous verbal agreement individually."

The Government of Ontario believed that "intuitively this must be so" -- the AAR was the body that made the rules for the American market and the American fleet. It was also clear, Ontario argued, that more resources were available on a continuing basis to AAR than to the Canadian regulatory authority. The Ontario Government's view, in respect of AAR, was that:

> "The difficulty is one of having adequate access to that body."
>
> "It would be our view that prior to attempting to replicate American facilities here in Canada that the Canadian Transport Commission attempt to gain access to the AAR deliberative process. This does not mean that the CTC should bind itself unreservedly to American standards. However, being a part of the deliberative process would permit the Commission to identify where its views differ from the American and where it would wish to depart from the American practice."

That, in the Ontario Government's view, was the point that Mr. Justice Grange was addressing in his report on Mississauga.

M-Trac's response to the issue posed by Mr. Justice Grange, and on which I asked for comment, reflected unease with the AAR's handling of the tank car situation and impatience with the Canadian regulatory authority's seeming passivity to AAR ascendancy:

> "A central question which arises from this inquiry is whether the Canadian Transport Commission and, through it, the Railway Transport Committee exercise sufficient control over the design, manufacture and operation of pressurized tank cars operating over Canadian track.
>
> In his 1980 report Mr. Justice Grange voiced criticism over the fact that much of this control rests in American hands. The car which failed, and cars similar to it, were designed in the United States, under the direction and supervision of the rail trade organization, the Association of American Railroads. Note it is not Canadian-American, simply American.
>
> This reference is not intended to be unduly critical of the AAR or its Tank Car Committee. Nevertheless, we are a sovereign country with technical abilities and technical goals of our own and it is questionable whether we need to depend entirely on the American rail

> technicians to tell us what kind of pressurized tank cars should run on our tracks."

According to M-Trac, it had been admitted during the inquiry that, in effect, the CTC had delegated its powers on design and production of 112 tank cars to the AAR. It was true that the Red Book spoke of CTC approval "but in fact the CTC doesn't exercise much influence over the AAR and its Tank Car Committee". Yet the inquiry's Technical Committee was calling now for greater scrutiny of the steel for tank cars and the production of tank cars.

M-Trac made this point:

> "Looking ahead, we can see that chemical traffic is likely to take an increasing slice of overall rail traffic. Has the CTC given enough attention to this prospect? If we are to continue to lean on the AAR to ensure the production of safe tank cars -- keeping the extremely low Canadian winter temperatures in mind -- must we be resigned to relating our needs and our goals to those of the American rail industry? Must we constantly look southward for direction of our requirements? Surely, it is time for an assessment of our Canadian technical abilities and our needs."

Canadian Pacific Limited did not, in final argument, deal with the issue that I had raised through the medium of Mr. Justice Grange's observations on Canadian public input in respect of AAR's work.

The views expressed by the parties who responded have been of great assistance to me. They have illuminated an issue that beyond doubt -- so far as I am concerned -- must be wrenched from the wings, brought to centre stage and conclusively dealt with. It is an issue that challenges the professional capacity of the Canadian Transport Commission as a safety regulator of railways. What is required now is the administrative action that must be presumed to have been delayed by other matters seemingly more urgent. The submissions before me confirm that the issue remains as clearly elucidated in the Grange Royal Commission Report of 1980.

What is <u>not</u> needed is an initiative by the Canadian Transport Commission seeded with nationalistic bias. (There is nothing of that in the comments and opinions expressed by Mr. Justice Grange.) We are not looking at new arrangements -- perhaps they should be called <u>additional</u> arrangements -- that will undermine, in any way, activities of the AAR or interfere with the Canadian railways' commendable participation in, and contribution to, this important trade association of North American railways.

What must be sought is a way of injecting meaningfully into the picture -- in addition to "private and American efforts" of undoubted benefit to Canadian railways and users of their services -- <u>the Canadian public interest</u>. In directing the Commission as to its regulatory mandate, Parliament, in its several statutes, has repetitively used the words "the

public interest" -- we are to uphold it. Surely, at the Canadian Transport Commission, there must come before all else the safety of Canadian citizens -- including employees of the railways -- amid all of our heterogeneous regulatory responsibilities in respect of the rail mode.

I had the impression, particularly reading the argument of CN, that there is a rather important apple cart here -- AAR and the Canadian railways' participation in it -- and for heaven's sakes, Commissioner Magee, don't upset that apple cart! But I do not seek to do so. Why would I? No party to this inquiry counselled that I should pursue the matter with that negative objective. Strangely enough, in deciding what I should say to the Commissioners, I think I can walk a path that, in the main, meets the views of all of the parties (and still be resolute!). I will try.

A careful analysis of every view expressed by the parties reveals an emphasis on particular aspects of concern, mainly as to the depth of involvement and the extent of 'independent action', arising from any newly-installed capacity of the Canadian Transport Commission to respond to AAR dicta. There seems to be no cleavage between the parties on the essential principle -- that being that the Commission's Railway Transport Committee ought to know what is going on. If Mr. Justice Grange, who analyzed the CTC's safety mandate in his Mississauga Royal Commission Report correctly, concluded that "the jurisdiction of the Commission and its committee in the government supervision and investigation of the railways is almost limitless" then --surely -- the Commission is supposed to know.

The advice which CN has given me in argument is correct, in my view, inasmuch as it addresses the importance of the Association of American Railroads and its essential coordinating role, both as regards interchange of freight cars and rendering Canadian and United States railway operations safe and compatible. I agree that the Canadian Transport Commission should be open on any occasion to "the advice, and the contribution of a body of experts of this nature" (AAR).

I do not agree that on an occasion when the necessity is imperative the Canadian Transport Commission should refrain, or even shrink, from "independent Canadian action".

I would expect that if satisfactory arrangements were in place as between the Commission and the Association seldom if ever would the necessity for independent action arise. When people with common goals -- trade associations of the transportation industry and regulatory agencies of government, the latter with their public input -- reason together about urgent safety problems it seems to me they are unlikely to disagree. I was occupied for 20 years in the first role and have been occupied in the second for the past 17 years. From that experience, I speak with conviction about establishing a meaningful and formalized communicative role between CTC and the AAR.

I would rather have seen the Canadian railways try to bring this about! Perhaps -- in the way they look at it -- they have. But, despite the goodwill that is evident, does it really advance us very far along the path to read in CN's argument, in reference to the Technical Committee's report:

> "Further, Canadian National Railway Company undertakes to provide the RTC with regular reports on the handling of these recommendations by the AAR."

As one of the Members of RTC, this is not for a moment an offer I would disdain. But is it the complete answer to a kind of relationship that enables us to say that we -- the Canadian Transport Commission -- have arrangements in place that meet fundamental requirements of the Canadian public interest?

Procor has told me in argument that these fundamental requirements of the Canadian public interest -- what might be called the Grange format (as to which Procor itself expresses no disagreement whatever) -- have been met in the practices and methodology followed in the inquiry, particularly the establishment and work of the inquiry's Technical Committee. I would, of course, be pleased to think that that is so. However, one must not lose sight of the fact that what was in effect in this instance was an ad hoc arrangement designed for problems confronting one particular public inquiry.

If the Canadian Government is serious about the Canadian Transport Commission's railway safety mandate -- and I have every reason to believe that it is -- what must be put in place in Canada are not merely ad hoc arrangements in reference to the Canadian regulatory authority and AAR. What must be in place in Canada is formal, friendly but firm communication between the Canadian regulatory authority and AAR as to what, in Washington, D.C., the Association there is approving for movement over 57,000 miles of railway track in Canada. There must be a settled, formal arrangement, with the funding and qualified staff required in Canada.

Nothing less will give Canadians a 'handle' on what is decided by the Association in Washington, D.C., as to standards and specifications of the various types of tank cars traversing railways, in Canada.

In cross-examination, Mr. Stanley Kaplan, Director, Dangerous Commodities, gave his view of how much further we need to go:

> "Q.: Is the CTC part of the Tank Car Committee?
>
> A: No, neither is the CTC part of the CSA and neither is DOT part of ASME.
> What is extremely necessary, I might just say this, and this is a personal opinion, is that the government and the ruling body follows somehow what the Association is doing. I don't see the reason for government to report a work which is owned by somebody else already.

What is important is just to be able to live with it, in that we follow up the development in the Association and that you will satisfy yourself that the work has gone on in the right way.

Q.: So you would not recommend that the government be involved in the AAR Tank Car Committee?

A.: No. I would not go that far.

What I would say is that the government should keep track of what the Tank Car Committee is doing and what the developments are and participate with them whenever there is developments, participating, maybe, on the technical side, and that I believe will be the appropriate mix."

I am sensitive to the fact that, in time of restraint, the expansion of staff, rather than the diminution of it, is not popular, although the government, since it took power, has made special provision for the health and safety of citizens. No problem of the kind I am addressing has ever struck me as glorious potential for empire building. Twenty prior years in the private sector has made that reticence ingrained. The fact that our total safety-related staff -- all aspects of rail safety, covering the whole of Canada -- numbers 152 is evidence of the care that has been shown in approaching the matter of staffing for safety.

So, too, in our equipment research and testing, whether before or after a railway accident: we have a contract with the Energy, Mines and Resources Ministry's excellent Physical Metallurgical Research Laboratories to do that kind of work for us rather than attempt to replicate such capability in the CTC. We have, too, a good working relationship with the National Research Council.

Some new staff, but no large infusion of staff, will, in my view, give us, at last, a capability to observe, study and respond meaningfully to the work of AAR in terms of the Canadian public interest:

"...it is not in my opinion enough to rely on private and American efforts..."

"We are concerned with the transportation of dangerous goods in Canada."

"We must take advantage of all knowledge to be obtained from any source..."

"...we must also attack the problems from the viewpoint of the Canadian public..."

"...I am sure there is in Canada knowledge and talent available to help."

It was recognized by Mr. Justice Grange that an AAR standard may, on the average, be acceptable to the Tank Car Committee members who prepared it. It may be acceptable to their respective 'constituencies' but these may or may not always include Canadian interests and concerns. It followed that Mr. Justice Grange felt that there was need for a review and evaluation mechanism that would function in Canada and, in respect of which, problems would be looked at from the viewpoint of the Canadian public. The performance of the ad hoc Technical Committee that served the RTC well in this inquiry bears out absolutely his surety that "there is in Canada knowledge and talent available to help".

A means of reviewing and evaluating AAR standards on behalf of the Canadian public should be created as a specialized advisory group under the aegis of the Commission's Railway Transport Committee. It must not be insular -- confined to RTC alone -- but should be structured, if possible, to tap knowledge and talent available to help, both inside and outside the Government of Canada and its agencies.

The organizational unit that is proposed should develop and maintain close relations with the AAR Tank Car Committee and there should emerge from this a two-way flow of information on activities and conclusions. An invitation to attend any meeting of the AAR Tank Car Committee at which our findings or technical expertise are sought by the Committee should be accepted forthwith -- in terms of public safety it is undeniably one of the most important bodies on the North American continent.

As well, the RTC organizational unit should maintain equally close ties with the Canadian railways, the tank car manufacturers, dangerous commodity tank car users, public bodies concerned with rail safety, research organizations, standards associations -- all who have interests in dangerous commodity tank car design and specifications. The object here should be adequate and comprehensive Canadian input to the proposed unit.

The overall objective is to utilize all developments of the AAR in the context of Canadian evaluation of standards and design specifications of tank cars running on Canadian railway tracks. If shortcomings or omissions are found there must be Canadian action to 'fill the gap', always in interaction with the interests who have direct concern.

Review and evaluation capacity in terms of tank car standards should be housed in the Railway Transport Committee, Regionally and at Headquarters, in a readily identifiable organizational unit. It must not be obscured. Its expert staff should be armed with a clearly defined mandate, known and understood outside the Canadian Transport Commission. Contact points should be "up front". The communication policy should be one of ready access to all concerned within CTC -- and it is emphasized, in another section, that this communication ought to be outgoing as well.

The work of this expert group should be so structured and directed that every category of dangerous commodity tank car in Canada -- presumed healthy or suspect, either having been involved in, or believed to have precipated, an accident -- is a known quantity to the Railway Transport Com-

mittee and a candidate for its action when deemed appropriate. All types of these cars, as they have passed through the AAR Tank Car Committee, will in, due course, have been reported upon to the RTC. When considered safe they should be formally approved in that regard. When it appears that a car type presumed healthy with no past record is now beginning to exhibit an inherent flaw this would be reported immediately to the RTC by the AAR and dealt with as circumstances require on both sides of the border.

"Action when deemed appropriate", as the need is perceived by RTC, should involve communication with the AAR and owners and operators of the equipment, together with such follow-up action as may be severally possible, but, failing that, by RTC unilateral action.

The RTC group should conduct its reviews and evaluations on a priority basis. Dangerous commodity tank cars should come first -- foremost among them, and of No. 1 priority, those carrying CTC-rated "Special Dangerous Commodities" -- the most dangerous of dangerous commodities listed in the Red Book. Later, as time permits, the other tank cars can be examined on a descending scale of priority, determined by the relative dangers of the lading regularly carried in each of these types of car.

During the preparation of this report there were, within RTC, two waves of special inspections of tank cars. The group whose formation I suggest should not only avail itself of any inspection reports, whether a product of regular or special inspections, but should be authorized to set in motion inspections associated with review of any tank car category. Such inspections should be carried out either by our Regional or Headquarters staff, as deemed appropriate in the circumstances.

The new structure in place in the Committee should continue our policy of making full use of available expertise and facilities within the Government of Canada -- some already referred to in this report -- thereby avoiding duplication of publicly-financed resources. The specialized RTC staff should, of course, avail itself as well of available resources in the Research Branch of the Commission. (Research has made, in addition to RTC's staff, a contribution of consistency and excellence in respect of our accident investigations.)

Even if the times and circumstances were opportune, I would not recommend the luxury of duplication of technical research facilities of AAR. In order to eradicate the void to which Mr. Justice Grange drew attention, this is not necessary in my view and I agree also that that precise course of action is not what Mr. Justice Grange intended. What is required is that the new group should be staffed by experts of the 'senior' variety and that they should have the qualifications and capacity to select, and make best use of, specialists, both inside and outside the Commission -- specialists in the technical and economic and risk evaluation fields, drawn from agencies of government and from private industry as well. This, by definition, requires an assigned budget to buy the diverse expertise required.

What I am confronting here is the health and safety of Canadian citizens in the face of an ever-increasing flow of dangerous commodity

traffic on the railways of Canada. The budget of the RTC group in liaison with AAR should, therefore, be inviolate. It should be administered by the unit itself, subject only to the appropriate checks, in terms of propriety, by the designated officers and agencies of the government.

Already stated is my belief that some new staff, but no large infusion of staff at this stage, would give us, at long last, a capability to observe, to study, and to respond meaningfully to, the important work of AAR. In part, that belief is based on the modest staffing --numerically -- that I see as necessary. But that is only part of the foundation upon which my expectations rest.

It must not be forgotten -- indeed we have been reminded of it in the arguments of the parties -- that the tank inquiry was assisted from the outset by an ad hoc Technical Committee that consisted of technical and expert persons drawn from the Railway Transport Committee: CN and CP Rail; the Association of American Railroads; M-Trac (having nominated Professor Weatherly from the University of Toronto); Procor Limited; Energy, Mines and Resources; and the Bureau of Explosives (AAR). This team worked efficiently and effectively in drawing conclusions, and in reaching concensus, on a very difficult and complex technical problem -- the cause of failure of UTLX 98646 and action proposed in respect thereof. Having regard for the somewhat adversarial atmosphere in which such hearings often start off, I was astonished and pleased by the Technical Committee's achievement.

What we saw in action here, and as a major contribution to uncovering the mysteries of UTLX 98646, was a multi-interest group -- one of proven viability in respect of deliberations that, at some future time, will again be required of RTC.

It is my impression that most, perhaps all, of the parties to the hearing would support the continued participation of its officers or assigned experts to a committee of this kind. This was primarily because of the perceived potential to reduce time and money spent to resolve the cause and implications of an incident. But my strong view is that there could well be another benefit -- that of review and evaluation of existing and new AAR standards in terms of their applicability in Canada. As was the case at my inquiry conducted on behalf of RTC, the Technical Committee in this role would not be the arbiter but would report to RTC.

It is well worth following up this development -- to see if there is here a useful, long-term mechanism, capable of interaction with the expert staff of the proposed new unit, the object being to enable RTC to get a more meaningful grasp on tank car standards and design specifications.

What will the proposed additional capacity of review and evaluation by the Railway Transport Committee achieve?

It will better protect the safety of the Canadian public by substituting a formal structure for ad hoc response in Canadian surveillance and regulation of design and specifications standards originating with the Association of American Railroads.

When that is done, it will better protect the safety of Canadians. It will butress significantly the credibility of the Railway Transport Committee at accident investigative hearings. Commissioners will be relieved of an experience that I, for one, have found demeaning -- that of stolidly receiving evidence about a failed dangerous commodity tank car, with design and specifications standards approved by the AAR in Washington, D.C., but having been subject to no meaningful review and approval in Canada for operations on railway lines passing through thousands of Canadian communities.

As one looks at Sections 227, 228 and 296(1) of the Railway Act -- to cite examples in the statutes -- more is required of us than that.

Subject to the availability of the supplemental staff unit required, hopefully with the contemplated interaction of the ad hoc Technical Committee, I recommend to the Railway Transport Committee that it:

(1) Review and evaluate existing and new AAR design and specifications standards for tank cars designated for dangerous commodity service to ensure adequacy in the context of the Canadian environment and circumstances.

(2) Develop proposed changes (additions, deletions, modifications) to the aforesaid AAR standards, if necessary, to ensure adequacy in the context of the Canadian environment and circumstances, making use of all available Canadian talent and facilities, including consideration of risk reduction and the economic and trade implications of such changes.

(3) Evaluate risk reduction, cost and other implications of implementation associated with the proposed changes.

(4) Prepare recommendations to the RTC for implementing those proposed changes which appear worthwhile from a technical and cost-benefit point of view.

(5) Ensure compliance with the aforesaid standards through monitoring, inspection and enforcement programs.

(6) Administer a specific budget and staff to facilitate the above.

(7) Prepare reports and advisory memoranda to the RTC Commissioners pertaining to the mandated duties.

(8) Maintain close liaison and observer status with the AAR Tank Car Committee, and close liaison with Canadian railways, tank car manufacturers and dangerous commodity tank car owners and users, public organizations and other interested parties.

(9) Develop an ongoing relationship with an advisory technical committee consisting of representatives from such bodies as CN, CP, the tank car industry, M-Trac, NRC and EMR (that committee to consist of no more than ten members).

(10) Conduct liaison, as necessary, with interested public and governmental bodies and otherwise ensure public knowledge of the Committee's activities and results.

The changes set out so as to strengthen our administration of the law -- and to give us a formal budgeted structure that will end a partial void north of the 49th parallel in regard to overseeing and approval of tank car standards -- could come to pass in another way than through this report: simply, on authority of the Committee's Chief Executive Officer, by taking the necessary steps to obtain approval of person-years and budget to enable us to exercise fully our regulatory powers. Other improvements in the past that were not quasi-judicial -- requiring no formal Order or Decision -- have been handled in that manner.

My feeling, in respect of the responsibility being addressed here is that the views and conclusions of the whole Committee -- all of its Commissioner-Members -- will be constructive and helpful and, affirmatively, will add authority in moving towards our objective. In this way, the matter will be understood not merely as one of additional staffing but as a further initiative of the Railway Transport Committee pursuant to the safety laws that Parliament directs us to administer.

*U.S. GOVERNMENT PRINTING OFFICE:1987-201-610:60049

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Official Business
PENALTY FOR PRIVATE USE, $300